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**Social science research on invasive species
management: Insights from outdoor cat
management**

**外来種管理に対する社会科学研究: ノネコ管理に基づ
く考察**

**北海道大学 大学院農学院
環境資源学専攻 博士後期課程**

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日本語要旨

本博士論文のゴールは、侵略的外来種であるノネコの管理に対する人々の選好を明らかにし、よりよいノネコの管理戦略を立案することを通じて、生物多様性の保全に貢献することである。そのゴールを見据え、本博士論文では三つの研究を行っている。一つ目および二つ目の研究では、生物多様性の保全が求められる奄美大島を事例地とし、地域住民と観光客のノネコ管理に対する選好についてそれぞれ把握した。その結果、市街地等の居住地域におけるノネコ管理に関して住民間で軋轢があることがわかった。そこで、三つ目の研究では、軋轢の緩和に資するべく、どのような文脈であれば、ノネコ管理に対する人々からの支持が最も得られるのかについて、一般市民を対象にノネコの管理目的に対する選好を把握した。これらの結果を踏まえ、利害関係者間の対立を最小限に抑えたノネコの管理戦略について提言を行った。なお、本研究におけるノネコとは飼主を持たないイエネコである。

侵略的外来種であるノネコは国際自然保護連合の侵略的外来生物ワースト100に掲載されるなど、生物多様性を保全する上で最も大きな脅威の1つとなっており、迅速な管理が求められている。しかしながら、ノネコの管理における利害関係者間の対立が、迅速な管理の実施を困難にしている。ノネコは、生物多様性への脅威に加えて、糞尿被害をはじめとする公衆衛生への被害や人獣共通感染症をはじめとする人間の健康に対する被害も引き起こす。さらに、屋外で生息するノネコは高い死亡リスクに晒されており、動物福祉の観点からも問題とされている。一方、ノネコは人々に癒しをもたらすなど人間に対して大きな利益も提供している。このようなメリット・デメリットがあるがゆえ、利害関係者間の対立が生じている。生物多様性の保全における利害関係者間の対立は、ノネコ管理に関する迅速な対応を妨げるため、ノネコ管理に対する利害関係者の選好を把握した上で、利害関係者が同意できる着地点を考えた管理戦略の立案が求められる。

本研究ではまず、生物多様性の保全が求められる奄美大島を事例地として、利害関係者間の対立を最小限に抑えたノネコの管理戦略について検討した。奄美大島は世界自然遺産への登録が期待されるなど豊かな自然環境を有している。しかし、奄美大島の生物多様性の保全にとって、ノネコは重大な脅威となっている。

奄美大島のノネコ管理における最も重要な利害関係者は地域住民である。そこで第2章では、構造型聞き取り調査によりノネコやその管理に対する地域住民の選好を把握した。聞き取り調査では、森林地域と森林地域と密接した居住地域である集落、多くの住民が生活している市街地では、ノネコ管理の主要課題が異なっていることを想定し、それぞれの地区ごとに選好されるノネコ管理について把握した。聞き取り調査で提示された対応方法は、致死的管理、捕獲後避妊去勢し再放獣

(TNR)、捕獲後里親を探すの3つであった。分析の結果、地域住民は森林地域に生息するノネコを否定的に捉えており、集落や市街地におけるノネコとは異なる対応が求められていることが明らかとなった。対応方法については、致死的管理は全般的に否定的であり、TNRの適用に対する認識は地域住民間で異なっていた。これらの結果を踏まえると、地域住民の対立を最小限に抑えたノネコの管理戦略としては、森林地域に生息するノネコを優先して捕獲し（ゾーニング管理）、捕獲後にノネコの里親を探す方法が望ましいと考えられた。一方、この方法は費用がかかることが課題である。

そこで第3章では、引き続き奄美大島を対象として、観光客に対して、ノネコ管理への参画についてその選好を把握した。奄美大島への観光客の多くは、奄美大島の豊かな自然環境を目的に訪れていることから、それらの保全に協力するインセンティブを持っていると考えられる。仮想評価法を用い、森林地域に生息するノネコを捕獲し、里親を探す管理への支払意志額を評価した。分析の結果、観光客の約80%に募金意欲が存在した。支払意志額は一人当たり平均1374.1円であった。支払意志額にはノネコやその管理に関する認識や希少種に関する認識が影響を及ぼしていた。これらの結果から、関心の高い観光客を奄美大島のノネコ管理に巻き込むことで、地域住民間でコンセンサスが得られるノネコの管理戦略を実現できることが考えられた。

最後に第4章において、日本の一般市民を対象に、人々が望ましいと考えるノネコの管理目的に対する選好を、ベスト・ワーストスケーリング(BWS)によって定量的に明らかにした。本研究で採用したBWSは、本課題のようにリッカートスケールで評価すると違いを明確にできない対象を評価する場合に有効な手法である。人々の外来種管理に対する選好は、何のために外来種管理を行うのかなど、外来種

管理に関する文脈に大きく依存することがわかっている。しかしながら、奄美大島でのノネコ管理を含め、ノネコ管理の多くが生物多様性を目的として実施されている。そこで、より人々からの支持を得るべく、人々に最も望まれているノネコの管理目的を明らかにした。

分析の結果、一般市民はノネコの管理目的に対して糞尿被害をはじめとする公衆衛生への対応を据えることが最も妥当であると評価していることが明らかとなった。次いで、人間の健康に対する対応であり、生物多様性を保全への対応が三番目、動物福祉への対応は四番目であった。BWSの推定結果に基づくと、ノネコ管理の実施目的に対して、公衆衛生への対応を一番に挙げる人は40%である一方、生物多様性を保全への対応を一番に挙げる人は21%にとどまると予想された。日本では公衆衛生という観点でのノネコ管理が求められており、生物多様性の保全という目的を掲げても、人々の協力は得られづらいことが明らかとなった。そのような中でも生物多様性の保全を進めるためには、公衆衛生や人間の健康に対する対応と並列した形で実施する必要がある。

これまで明らかにしてきた知見を踏まえると、生物多様性保全に寄与する利害関係者間の対立を最小限に抑えたノネコの管理戦略について次のような提言を行うことができる。第一点目はゾーニング管理の重要性である。奄美大島の事例では、森林地域での管理を他地域での管理と異なるものとして評価していた。このような違いに着目し、場所を絞った対応策を講じることで、利害関係者間のコンセンサスを得て、迅速な対応が期待できる。第二点目は、観光客など地域外の利害関係者の支援を得ることの重要性である。観光客などは、生物多様性を保全が求められているような地域に価値を見出している可能性が高い。それらの人々の資金的援助も得られれば、高額であっても利害関係者間のコンセンサスが得られるノネコの管理戦略を実現することが可能である。第三点目は、生物多様性保全を目的とするノネコ管理は人々の主要な関心ごとではないことを前提にしなければならないということである。ノネコ管理において、公衆衛生への対応が望まれていることは、日本においてより多くの人々からの支持される管理を考える上で、非常に重要な基礎的知見である。

Chapter 1. General Introduction

1.1 Social science research in invasive species management

1.1.1 *Issues with invasive species*

Invasive species contribute to biodiversity loss and ecosystem degradation (Doherty et al., 2016; Spatz et al., 2017). Invasive species are those that have been introduced to an area by accidental release and by people, i.e., human actions are the primary means of invasive species introductions (Vitousek, Mooney, Lubchenco, & Melillo, 1997). Invasive species are recognized as the second greatest threat to species endangerment and extinction, after habitat destruction, especially on islands (Wilcove, Rothstein, Dubow, Phillips, & Losos, 1998; Spatz et al., 2017). Previous evidence suggests that 30 invasive species are responsible for the extinction or endangerment of 738 vertebrate species; this is estimated to be 58% of all bird, mammal, and reptile extinctions (Doherty et al., 2016).

Invasive species also cause economic harm and harm to human health (Hobbs, 2000; CBD, 2008). Species endangerment and extinction also lead to the degradation of human well-being, including primary industry (e.g., fishery, agricultural, and forestry products) and services (e.g., clean and plentiful drinking water, climate stabilization, pollination, culture, and recreation). For instance, according to the US Fish and Wildlife Service (2012), the economic and social impacts of invasive species, including their direct economic damage and the costs associated with their management, are estimated to be approximately USD 120 billion per year. In Aichi target 9, there have been concerted efforts to identify and manage biological invasions, and reduce their negative impact, by 2020; however, to date, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Service (IPBES) has evaluated the progress of target 9, especially targets 9.3 (Invasive species controlled or eradicated) and 9.4 (invasive

introduction pathways managed), as being poor (IPBES, 2019). Thus, invasive species management remains an important field of environmental policy and practice.

1.1.2 Importance of social dimensions in invasion science

Despite a general agreement of the importance of invasive species management, it is also controversial, since invasive species management often includes the eradication of valued species (e.g., Pejchar & Mooney, 2009). Shackleton, Shackleton, and Kull (2019) reviewed studies focusing on invasive species and found that 16% of species provided mainly benefits, including recreational and spiritual services and the opportunity to earn a cash income. In addition, recent evidence indicates that incompatible different ethical perspectives associated with charismatic invasive species also causes conservation conflicts (Jarić et al., 2020). Conservationists, for instance, prioritize ecosystem and biodiversity conservation, whereas advocates are concerned for the welfare of the charismatic invasive species (Genovesi & Bertolino, 2001; Wallach, Lundgren, Ripple, & Ramp, 2018). As a previous review study demonstrated, ignoring these social and political dimensions and engaging in unilateral communication could lead to conflicts (Crowley, Hinchliffe, & McDonald, 2017). Therefore, social science research on invasive species has a key role to contribute to policy development and enhancing management strategies.

1.2 Outdoor cat management is one of the most controversial issues

1.2.1 Negative impacts of outdoor cats on biodiversity

Outdoor cats (*Felis catus*) are one of the invasive species with the most serious and pervasive impacts on biodiversity (Figure 1; Doherty et al., 2016). Some introduced cats are feral, stray, and free roaming, which means they are untamed and generally unsocialized to humans (Barrows, 2004; Levy & Crawford, 2004). These outdoor cats cause biodiversity loss and

ecosystem degradation through predation on native species, competition with native wildcats for ecological niches, and transmission of infectious disease, such as feline immunodeficiency virus (Bonnaud et al., 2011; Loss et al., 2013; Lowe et al., 2000; Medina et al., 2011). Outdoor cats have contributed to 26% of all extinctions and have had negative impacts on 420 extinct and threatened species around the world (Doherty et al., 2016). The impacts of outdoor cats on native species do not differ across habitats and landscapes; in other words, in both rural and urban areas, outdoor cats, including feral and stray cats, pose substantial threats to native fauna (Baker et al., 2005; Lepczyk et al., 2004). As a result, outdoor cats are now regarded as one of the most dangerous invasive species (Lowe, Browne, Boudjelas, & De Poorter, 2000).

The impacts of outdoor cats on native species are more serious in enclosed spaces, such as islands where cats or other carnivorous mammals are not endemic predators (Doherty et al., 2016; Medina et al., 2011; Nogales et al., 2004). More than 16 million animals are estimated to be killed by cats each year in New Zealand, where there are no native mammalian predators other than bats (Medina et al., 2011). Studies show that at least 248 species, including mammals (Mellink, 1992; Tershy et al., 2002), reptiles (Iverson, 1978; Mitchell et al., 2002), and birds (Jehl & Parkes, 1983; Veitch, 2001), have been negatively affected by feral cats on 120 islands around the world (Bonnaud et al., 2011; Medina et al., 2011). As such, the implementation of management strategies for outdoor cats is necessary to conserve island biodiversity and restore native ecosystems (Doherty et al., 2016). This is particularly important since previous studies have reported that native ecosystems and endemic species populations have been able to recover after the elimination of outdoor cats (Bester et al., 2002; Ratcliffe et al., 2010).

1.2.2 *Negative impacts of outdoor cats on human lives and animal welfare*

In addition to the issues associated with biodiversity, outdoor cats have a substantial negative impact on human lives in residential areas (Figure 1). Outdoor cats are a significant challenge to human health via zoonosis (Blanton et al., 2011; Halfmann et al., 2020; Levy & Crawford, 2004), cat bites, and scratches (Levy & Crawford, 2004; Patrick & O'Rourke, 1998; Wright, 1990). Outdoor cats also have a substantial negative impact on the cleanliness of their environments; an outdoor cat is a nuisance in urban neighborhoods because it defaces property, messes up the garbage, and causes trouble to pets (Dabritz et al., 2006; Mameno et al., 2017; Toukhsati et al., 2012). In addition to the above-mentioned issues, outdoor cats also experience challenges related to animal welfare; they can suffer from parasites and infectious diseases, traffic accidents, crawling into a car engine, and entering storm drains (Birkenheuer et al., 2006; Loyd et al., 2013; Maruyama et al., 2003; Rochlitz, 2003). In particular, the prevalence of parasites and infectious disease among outdoor cats can also pose a risk to owned pet cats (Loyd et al., 2013; Yamaguchi et al., 1996).

1.2.3 *Positive impacts of outdoor cats*

Despite outdoor cats' threats to biodiversity and human life, outdoor cat management is a controversial issue worldwide due to the positive aspects of outdoor cats on human well-being (Figure 1). Originally, cats were introduced to control rodent or rabbit populations (Flux, 1993). In fact, cats kill pests, thus reducing the risk of disease spread. Cats are also one of the most popular companion animals worldwide and have several positive roles in human lifestyles (Hall et al., 2016). Cats comfort people, and interactions with cats, including outdoor cats, relieve stress and improve human health (Brickel, 1979; Siegel, 1990; Wood, Giles-Corti, Bulsara, & Bosch, 2007). Wald, Jacobson, and Levy (2013) reported that cats provide significant benefits to

90 humans; many people tend to have a positive feeling about cats. In addition, cats provide their
91 owners with opportunities to build social connections among themselves (Brickel, 1979; Siegel,
92 1990; Wood et al., 2007) and help children learn about responsibilities (Melson, 2003; M.
93 O'Haire, 2010; M. E. O'Haire, 2013).

94



Figure 1. Example of negative and positive impact of outdoor cats

(a): Negative impact, outdoor cats that live in the forest are predators of wildlife. (b): Negative impact, outdoor cats cause trouble in the Town and Rural neighborhoods. (c): Positive impact, people enjoy watching and feeding to outdoor cats. (d): Positive impact, our quality of life and tourist's experience are made better by cats, especially for cat lovers.

1.2.4 *Conservation conflicts surrounding outdoor cat management*

The positive effects of outdoor cats lead to conservation conflicts, especially on inhabited islands. Review studies have shown that successful cat eradication campaigns are conducted using lethal options and take place almost exclusively on uninhabited islands (Campbell et al., 2011; Nogales et al., 2004). On inhabited islands, outdoor cat management is one of the most controversial issues. Since outdoor cats are linked to human lives, non-lethal options, which are often inefficient methods, should also be applied to outdoor cat management on inhabited islands (Bester et al., 2002; Campbell et al., 2011; Nogales et al., 2004).

One controversial topic is the management of outdoor cats on islands. On inhabited islands, outdoor cats are often not managed by their removal, but via the maintenance of colonies with spaying or neutering (i.e., Trap-Neuter-Return (TNR): trapping the cat, spaying or neutering it, and returning the cat to its original location; Drennan, 2012). Most conservationists, such as “bird conservation professionals”, support the removal of all outdoor cats because of their contribution to the degradation of native wildlife and ecosystem (Peterson, Hartis, Rodriguez, Green, & Lepczyk, 2012). The supporters of outdoor cat removal have criticized management methods that do not eliminate wildlife predation or effectively reduce cat colonies, such as TNR. Conversely, management via TNR is supported by animal welfare groups and cat advocates, who recognize the significant benefits of outdoor cats, and claim conservationists exaggerate the negative impacts of outdoor cats on wildlife. In fact, in 2020, more than 200 municipalities received financial support to perform TNR from Dōbutsukikō, Japan, resulting in TNRing more than 2000 outdoor cats (Dōbutsukikō, 2020).

Conflicts between stakeholders are a major barrier to effective management (Nimmo & Miller, 2007; Novoa et al., 2018). Management outcomes can be influenced by stakeholder

support for management objectives and goals (Decker, Krueger, Baer, Knuth, & Richmond, 1996; Ford-Thompson, Snell, Saunders, & White, 2012; Reed et al., 2009). Outdoor cat management can also be delayed by legal action against management organizations and citizen ballot initiatives (Chase, Schusler, & Decker, 2000; Manfredo, 2008; Perry & Perry, 2008). Review studies also indicate that a lack of public support for outdoor cats is one of the main reasons for the failure of outdoor cat management strategies (Campbell et al., 2011; Nogales et al., 2004).

1.3 Previous social science literature on outdoor cats and their management

1.3.1 Previous studies about social preferences for outdoor cats and management on islands

It is important to understand public preferences for outdoor cats and their management to achieve biodiversity conservation while maximizing their social benefits through effective cat management. Given the aforementioned issues, previous studies have investigated public preferences and attitudes toward outdoor cats and their management on islands. One of the most relevant studies is by Lohr and Lepczyk (2014), who clarified the attitudes of residents on Hawaii, a biodiversity-rich island, toward outdoor cat management. This study showed that almost all Hawaiians agree that outdoor cats should be eradicated, and that the most preferred management option is live capture and lethal injection, whereas TNR is the least preferred method. Wald, Lohr, Lepczyk, Jacobson, and Cox (2016) also uncovered a difference in the attitudes of Hawaiians and Floridians: Hawaii residents have a significantly lower acceptance of outdoor cats and a higher perception of the negative impacts of outdoor cats than Florida residents, which can be attributed to a long history of issues with invasive mammals in Hawaii (Wald et al., 2016). Farnworth, Campbell, and Adams (2011) also investigated the attitudes of island residents toward outdoor cat management in New Zealand; the findings implied that New

Zealand residents consider conservation values of greater importance than welfare with respect to outdoor cat management (Farnworth et al., 2011).

1.3.2 *Previous studies targeting residents in mainland areas*

Other studies have addressed the social attitudes of mainland residents. For example, through a survey of university undergraduate students, Wald and Jacobson (2013) found that support for cat management was influenced by attitudes toward the presence of cats and perceptions of the ecological impacts of cats on wildlife and the environment. A previous study also uncovered that cat owners tend to have a more negative opinion of the introduction of regulations on cat ownership, especially when they live in rural areas (Calver, Thomas, Bradley, & McCutcheon, 2007). Loyd and Miller (2010) demonstrated that people living in rural areas preferred lethal cat management methods, compared to people living in urban areas, and women were less accepting of lethal options than men. Dabritz et al. (2006), Lepczyk et al. (2004), and Wald et al. (2013) all noted that cat owners preferred TNR more than non-owners.

1.3.3 *Knowledge gaps*

Although many previous studies have investigated the social dimensions of outdoor cat issues and their management (e.g., MacDonald, Milfont, & Gavin, 2015), almost all studies were conducted in the US, UK, and Oceania regions. As such, very little attention has been paid to public preferences for outdoor cats in Asia, which is one of the most important biodiversity hotspots. Hall et al. (2016) compared attitudes toward cats, including pet cats, and their impacts on wildlife and cat management between individuals in Japan, the UK, the US, Canada, Australia, New Zealand, and China. This study found that Japanese people have unique attitudes toward pet cats and their management: they tend to not recognize the negative impacts of pet cats

on wildlife, and their views are more in agreement with restrictions on pet cats than non-owners. The authors concluded that these unique attitudes toward pet cats and their management can be attributed to cultural aspects in Japan (Hall et al., 2016). In addition, as Hall et al. (2016) noted, most Japanese studies investigating public attitudes toward cat issues have focused on urban areas (e.g., Uetake, Yamada, Yano, & Tanaka, 2014), and little is known about the social preferences for outdoor cat management on islands, even though outdoor cats have a significant impact on native species on islands.

1.4 Background of outdoor cat management on Amami Oshima Island, Japan

1.4.1 Outdoor cat issues in Japan

In this dissertation, I address the knowledge gaps with mainly focusing on Amami Oshima Island, Japan. In Japan, there is a growing awareness of the issues associated with outdoor cats¹ (e.g., Glen & Hoshino, 2020; Mitsui et al., 2018; Ministry of the Environment, 2018). Outdoor cat has negative impacts on native ecosystems in Japan, especially on islands. As a result, outdoor cat has been nominated in 100 of the Japan's Worst Invasive Alien Species (Ecological Society of Japan, 2003).

1.4.2 Overview of Amami Oshima Island

Amami Oshima Island, Japan is a part of the Nansei Islands in the southern Japanese archipelago (28°19'N, 128°22'E; Figure 2). It is the fifth-largest island in Japan (712 km²), and the number of residents on the island is about 70,000 (Japan Census estimate, 2010), who mainly live in two areas: Naze area (37,000 people; 70% of population in the island) and Koniya area (5,000 people;

¹ The targets, i.e., the definition of outdoor cats, in this dissertation are basically all cats habiting outdoor, except for free-roaming pet cats. However, in only chapter 3, it notes that I mainly focused on the outdoor cats living in Forest with referring to the current policy.

15 % of population in the Island). In this dissertation, I refer to both these areas as “Town”. There are many small villages along the coast and near the subtropical broad-leaved forests which is covered with approximately 86% of Amami Oshima Island. I also refer to the village areas as “Rural” in this dissertation.

Amami Oshima Island, especially in the subtropical broad-leaved forests (hereafter, “Forest”), which provides a habitat for various endemic and rare species. There are more than one thousand endemic species in the Amami Islands, including *Pentalagus furnessi* which is called as Amami rabbits and listed as “Endangered” on the IUCN Red List of Threatened Species (Amami Oshima Island, 2015; Yamada & Sugimura, 2008). In addition, the island has the Japan’s second largest mangrove forest, which plays an important role in biodiversity conservation (Lugo & Snedaker, 1974; Polidoro et al., 2010). In particular, there are endangered and endemic species, such as *Odorrana splendida* and *Plecoglossus altivelis ryukyuensis*, around the mangrove forest (Kishino & Yonezawa, 2013; Nishida, 1988). Although Amami Oshima Island covers only about 0.3% of areas of Japan, there are a total of 16 % of species in Japan. Given its rich biodiversity, part of the island is a protected area that is expected to become a Natural World Heritage Site. Thus, the valuable environmental resources, including biodiversity, on the island is unusual environment in the world.

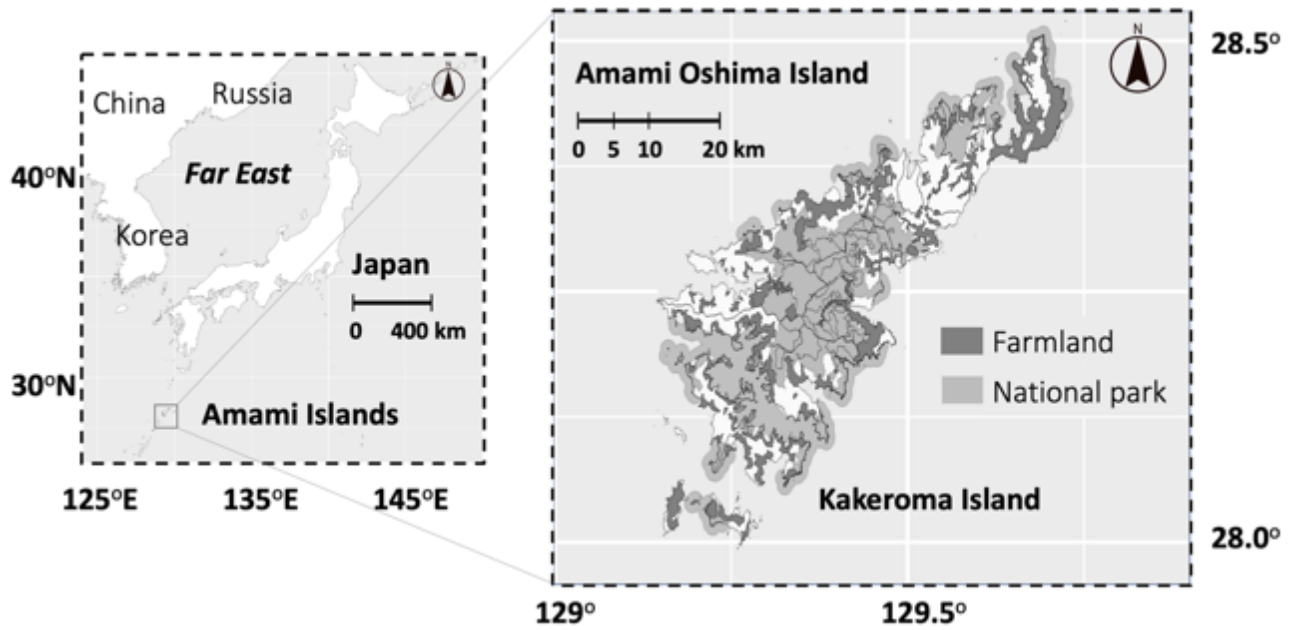


Figure 2. Map of the study site, Amami Oshima Island

* It is generally called Amami Oshima Island including Kakeroma Island because of the same administrative division. In this dissertation, Kakeroma Island was also regarded as a part of Amami Oshima Island

1.4.3 *Outdoor cat issues on Amami Oshima Island*

However, the designation of a Natural World Heritage Site has been prevented by the threat of invasive mammalian species, including outdoor cats (IUCN, 2018). Since non-native species are only predators and carnivorous mammals in Amami Oshima Island, outdoor cats have threatened the native fauna. Shionosaki et al. (2015) showed that outdoor cats were predators of lots of endangered endemic mammals. The Ministry of Environment also reported that outdoor cats preyed not only the endangered endemic mammals but also endangered endemic birds and frogs (Ministry of Environment, 2018).

There are also other issues relating to outdoor cats. Outdoor cats, especially live in Rural and Town, also cause several issues associated with human and social health. According to the interview survey to the Amami City officer conducted on December 7 to 10 in 2015, over one hundred complaints against troubles caused by outdoor cats were received at Amami City from April to September in 2015: e.g., the smell of excrement, sounds in the mating season and scavenging in garbage cans. On the other hand, the welfare of outdoor cats in Amami Oshima Island can be also serious. My interview survey to residents found that many residents had the experience that cat died in traffic accidents and/or from emaciation. In addition, according to the interview survey with the veterinarian on June 2 in 2015, some outdoor cats died due to physical abuse.

1.4.4 *Outdoor cat management and their challenges on Amami Oshima Island*

There is also a growing awareness of the above outdoor cat issues and management on Amami Oshima Island; for example, the number of Amami-Shinbun newspaper articles which include the word of “outdoor cat” is increasing (Figure 3). Therefore, not only the Ministry of Environment but also local government have addressed the outdoor cat management by divided

235 two categories based on the cat situations on Amami Oshima Island. Firstly, the local
236 governments, e.g., Amami City, have mainly conducted TNR for outdoor cats roaming Town and
237 Rural. In addition, the outdoor cats which can not grow wild themselves have been applied
238 euthanasia by Kagoshima prefecture. The population of outdoor cats is estimated at 5,000-
239 10,000. Secondly, outdoor cats roaming Forest have been managed by Adoption; however, if
240 there are no new owners within 5 days after live-captured them, the outdoor cats have been
241 applied euthanasia. The management started in 2018. It has been estimated by the Ministry of the
242 Environment (2015) that there are about 600-1,200 outdoor cats roaming Forest.

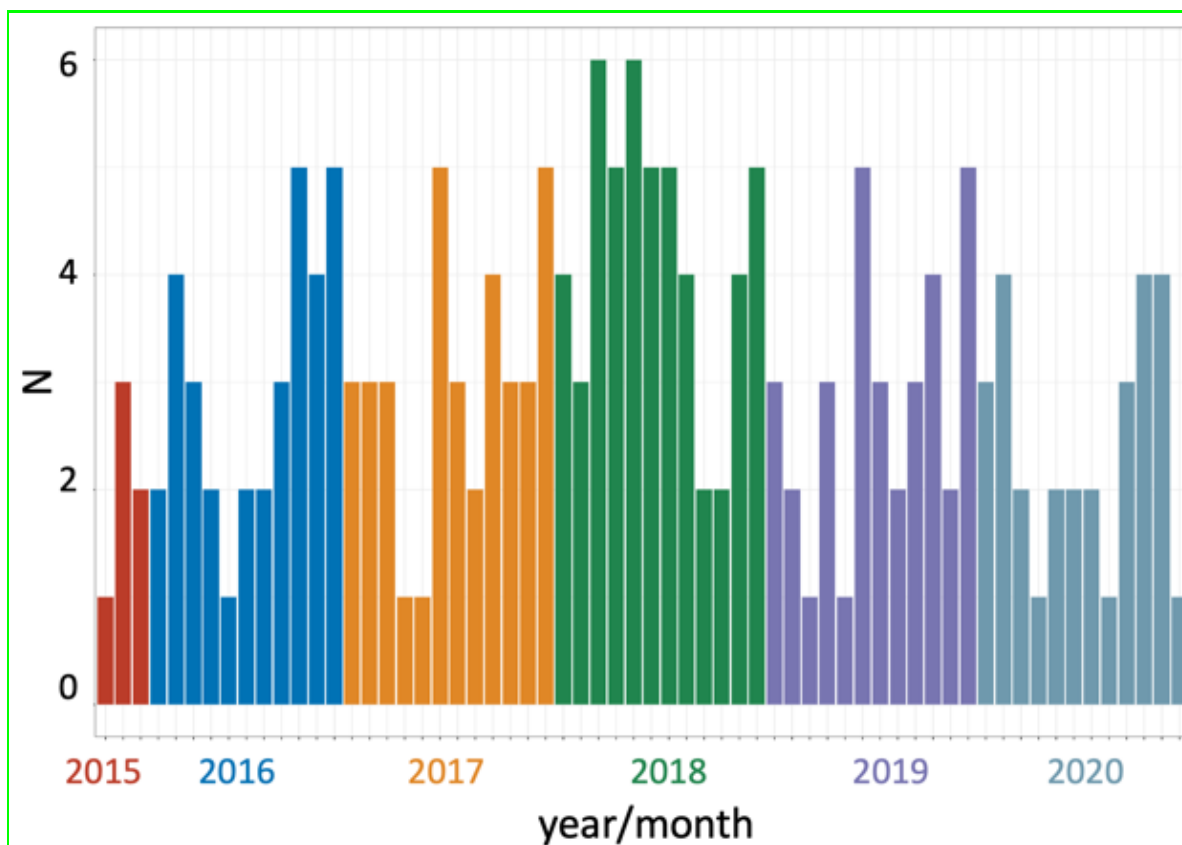


Figure 3. The number of articles about outdoor cats in the Amami-Shinbun newspaper

This figure illustrates the number of Amami-Shinbun newspaper articles that included the phrase “outdoor cat” for each month from 2015-2020.

However, current management strategies have received much criticism. In particular, the use of euthanasia to control outdoor cats is controversial, and animal welfare groups as well as some academic researchers and politicians have asked for the reconsideration of this management strategy. Moreover, based on an interview survey, I also found that some residents were comfortable with outdoor cats because they hunt rats in crop fields and keep venomous snakes away from residential areas. As such, these residents disagree with the removal of outdoor cats, and they feed these cats despite a local law that bans feeding outdoor cats without social order. Thus, there are social conflicts between stakeholders with respect to outdoor cat management on Amami Oshima Island.

In addition to social conflicts, management requires financial resources. That is because two reason. Firstly, only 11 outdoor cats roaming the forests on Amami Oshima Island were captured between April 1 and September 30. Secondly, according to the Ministry of Environment (MoE), although the current management plan in forests covers one-sixth of all the forest area on the island, the plan will expand to include the whole forest area in 2023. Thus, there is a need for additional management effort and resources.

1.5 Purpose of this dissertation

The main objective of this dissertation was to understand the social preferences for cat management in biodiversity hotspot islands in Japan, using Amami Oshima Island as a case. Based on my results, I also attempted to discuss strategic management planning for outdoor cat management in Japan.

1.5.1 *Understanding social preferences for outdoor cat management on Amami Oshima Island*

Firstly, I investigated the preferences of residents, who are an important stakeholder in outdoor cat management on Amami Oshima Island; I did this to answer two research questions:

- I. Do residents support the management of outdoor cats in each cat habitat, i.e., towns, rural areas, forests, on Amami Oshima Island?
- II. Which outdoor cat management options do residents prefer for each cat habitat on the island?

As described above, Amami Oshima Island has rich biodiversity and is expected to be designated as a natural World Heritage site; however, the predation of outdoor cats on native fauna is significant, and there is a need to enhance outdoor cat management plans on the island. Since the ecology and behavior of outdoor cats partially depends on humans (Shionosaki, Shigeki, Yamada, & Shibata, 2016), public support for the management of outdoor cats is necessary for its success. Nonetheless, to date, little is known about residents' preferences for outdoor cats inhabiting areas on the island and their management. Therefore, the answer to this research question provides useful insight for the development of a management strategy; in other words, the present study helps to understand whether residents prefer zoning management, and which zoning management strategy is most preferred.

In addition to residents' preferences, I also investigated tourist preferences for outdoor cat management to answer the following research question:

- III. How much are tourists willing to financially support the current outdoor cat management strategy of using a non-lethal option on the island?

Tourists are an important stakeholder on Amami Oshima Island because local communities, especially those around protected areas, depend on tourism for revenue. Moreover, a previous

study indicated that tourists can compensate for human and financial resources shortages for invasive species management (Mameno, Kubo, Shoji, & Tsuge, 2020); however, little is known about their willingness to support the management of outdoor cats.

1.5.2 *Understanding how to increase public support for outdoor cat management in Japan*

Finally, this dissertation also explored how to build consensus and/or increase public support for outdoor cat management in Japan. As a result of the above investigation, I found that outdoor cat management in towns and rural areas has the potential to cause conservation conflicts among residents. This implies that, to accelerate outdoor cat management in biodiversity hotspots in Japan, it is necessary to explore how to build consensus and/or increase public support for outdoor cat management. Previous studies have shown that social preferences for invasive species management significantly depend on the context and are affected by the provision of information (Ford-Thompson et al., 2012; Mameno et al., 2020; McLeod et al., 2017). Therefore, I investigated how goal setting increases public support for outdoor cat management and the impacts of the provision of information on citizen preferences. To understand general preferences and impacts, the targets of my survey were general Japanese citizens, and the research questions were as follows:

IV. Which goals, among biodiversity conservation, maintenance of a sanitary environment, prevention of zoonotic disease, and cat welfare, do citizens prioritize with respect to outdoor cat management?

V. Does the provision of information affect citizens' social preferences and their prioritization of outdoor cat management goals?

Several outdoor cat management plans have been introduced and/or are under consideration to improve human welfare, the natural environment, including biodiversity, and

feline welfare. Recently, local governments and the MoE have been required to achieve several goals through outdoor cat management; however, little is known about the social priority of these goals. Since outdoor cat management has often faced challenges balancing multiple management goals, prioritization of management goals plays an essential role in the implementation of an effective management strategy. Since social preferences for invasive species management depend on the context, evaluating the prioritization of strategies and goals from social dimensions provides valuable insight for the implementation of effective outdoor cat management with minimal conflict. Results contribute to existing knowledge concerning manners through which to increase public support, as well as prioritization of management goals.

1.5.3 *Expected contributions of this dissertation*

By answering the above research questions, this dissertation contributes to the feasible effective management of outdoor cats with minimal conflicts on biodiversity-rich islands in Asia. Because they are comparison animals, i.e., their population is huge, the management of outdoor cats requires a long-term effort; however, conservation budgets tend to be limited (Anand, 2004; James, Gaston, & Balmford, 1999). Therefore, an effective management plan with citizen support must be implemented under a limited environmental management budget. On Amami Oshima Island, particularly because it is expected to be designated as a natural World Heritage site, outdoor cat management is an urgent issue. Considering that the integration of social preferences into policymaking minimizes conflicts (Novoa et al., 2018; Shackleton, Adriaens, et al., 2019), the findings of this dissertation may help to implement effective outdoor cat management plans under a limited budget. The present study also provides useful insights for the development of policy and management strategies relating to outdoor cats on the island, based on citizens' preferences for outdoor cat management.

1.6 Content and flow of the present dissertation

The remainder of this dissertation is organized as follows. To address the first and second research questions, Chapter 2 presents an evaluation of residents' preferences for outdoor cats and their management within each outdoor cat habitat on Amami Oshima Island, where the management of outdoor cats is urgently required. In Chapter 2, I also discuss the necessity for zoning management on Amami Oshima Island. On Amami Oshima Island, tourists are important stakeholders because nature-based tourism partially supports the local economy, which contributes to biodiversity conservation; therefore, Chapter 3 presents an evaluation of tourists' willingness to support outdoor cat management on Amami Oshima Island. Chapter 4 presents an evaluation of general citizens' preferences for each outdoor cat management goal. Then, I also assess the impacts of the provision of information on social preferences for outdoor cat management. Based on citizen preferences, I discuss the priority of the goals of outdoor cat management in Japan. This dissertation closes with a discussion of challenges and policy implications in Chapter 5.

Chapter 2. Understanding residents' attitudes toward cat management on Amami Oshima Island

This chapter aims to address two research questions, i.e.,

- I. Do residents support the management of outdoor cats in each cat habitat, i.e., towns, rural areas, forests, on Amami Oshima Island?
- II. Which outdoor cat management options do residents prefer for each cat habitat on the island?

I evaluate residents' preferences for outdoor cats inhabiting and their management in each outdoor cat habitat on Amami Oshima Island. Despite only about 0.3% of areas of Japan, Amami Oshima Island has a total of 16 % of species in Japan. Given its rich biodiversity, part of the island is a protected area that is expected to become a Natural World Heritage Site; however, on the island, outdoor cat management is required to enhance, and the management requires public supports. IUCN requires to implement outdoor cat management to conserve rich biodiversity on the island. Although several types of outdoor cat management have been applied on the island, the current outdoor cat management on Amami Oshima Island is controversial. However, little is known about residents' preferences for outdoor cats in each habitat; moreover, limited studies investigate that residents' preferences for the management of outdoor cats in each outdoor cat habitat in Amami Oshima Island, Japan. Therefore, the results of this chapter help to discuss the necessity of zoning management on Amami Oshima Island.

Therefore, the purpose of this study was to understand residents' preferences for management of outdoor cats in Amami Oshima Island, Japan. It is necessary to study the residents' attitudes toward outdoor cats in order to manage them with minimizing conflicts on the island. This is particularly important because residents can perceive a variety of merits and

demerits about cats, and a uniform management strategy conducted everywhere is unrealistic, even within the island. Understanding the attitudinal differences among areas can help the decision makers devise appropriate management strategies and lead to successful zoning management, while respecting the residents' opinions. As described above, public behaviors and attitudes are important parts of the ecology of outdoor cats. Therefore, it is necessary to understand the local residents' attitudes toward outdoor cats to devise a successful management strategy. To promote consensus building among the stakeholders, I also compare the attitudes of cat-owners and non-owners, based on previous findings.

2.1 Methods

2.1.1 Survey and analysis design

I conducted face-to-face structured interviews with the residents using a questionnaire. The questionnaire using this study mainly comprised questions concerning three aspects: residents' attitudes toward the outdoor cats inhabiting, their attitude toward management options (adoption, TNR, and lethal options), and individual characteristics, including experience of owning cats (Appendix 1). Regarding the former two aspects, respondents were asked their preferences by three areas: Forest, Rural, and Town areas, using 5-point Likert-scale questions (from 1: strongly disagree, to 5: strongly agree).

To understand the regional differences in attitude toward outdoor cats inhabiting and management strategies, I carried out a one-way ANOVA with Tukey's HSD test. Bartlett's test was used to check if there were any differences in the variance of data. In addition, similar to previous studies (e.g., Dabritz et al., 2006; Hall et al., 2016; Levy, Woods, Turick, & Etheridge, 2003), I compared the attitude between cat-owners and non-owners. This was done by carrying out an unpaired t-test with the F-test, assuming that there were no differences in variance. All the

398 analyses were carried out on the 5-point Likert-scale data obtained in response to the
399 questionnaire. The analyses were carried out using R (Version 0.99.447 and the standard
400 equipment packages therein; R Core Team, 2016).

401 2.1.2 *Data*

402 The structured interviews were conducted with Amami Ohshima residents in 2015. I recruited
403 participants using stratified sampling for place of residence. I collected 82 completed responses
404 from the local respondents; Table 1 shows their socio-demographic characteristics. Of the
405 respondents, 60–70 years was the most common age group (22%), followed by 50–60 years.
406 Males comprised about half of the respondents. Over a half of the respondents lived in the Town
407 area (57%), whereas the others lived in the Rural area. In terms of the experience of owning cats,
408 about one-third of the respondents were owners in the past, and about one-quarter owned cats at
409 the time of survey. As a result, about half the respondents had experience of taking care of cats
410 (Table 2). Thus, in this dissertation, I refer to respondents who had such experience as “cat-
411 owners” and the others as “non-owners”.

412 **Table 1. Socio-demographic characteristics of respondents**

Variable		Rate of respondents: This study		Population of Amami in 2010*
		<i>n</i>	Rate (%)	Rate (%)
Gender	Male	38	46.3	47.8
	Female	40	48.8	52.2
	Unknown	4	4.9	-
Age	15-19	4	4.9	4.9
	20-29	7	8.5	7.5
	30-39	8	9.8	13.0
	40-49	9	11.0	13.8
	50-59	14	17.1	19.8
	60-69	18	22.0	15.4
	70-79	11	13.4	14.7
	80-89	5	6.1	10.9
	Unknown	6	7.3	-
Residence	Town	47	57.3	85.1
	Rural	35	42.7	14.9

413 * 2010 Japan Census

414 **Table 2. Rate of respondents’ experience of owning cats**

Variable		<i>n</i>	Rate (%)
Experience of keeping cats	Owning cats now	19	23.2
	Used to own cats	26	31.7
	Have never owned cats	37	45.1

415

2.2 Results

Table 3 shows the average attitudinal scores toward outdoor cats inhabiting, as well as the attitudinal differences between cat-owners and non-owners. According to the results of the one-way ANOVA, these average scores were significantly different by areas ($F = 7.98$, $df = 2$, $p < 0.01$). The residents expressed a more negative attitude toward outdoor cats in the Forest area (mean = 1.84, SD = 1.17) than in the Town (mean = 2.488, SD = 1.33) and Rural areas (mean = 2.77, SD = 1.34), although there was no significant difference between the Town and Rural areas (Table 3). In the other words, Table 3 shows that, on average, residents less preferred outdoor cats inhabiting in Forest compared with the other areas. In addition, there were differences between cat-owners and non-owners regarding their attitudes toward outdoor cats. The cat-owners showed attitudinal differences between the Forest and the other areas, whereas the non-owners had no area-wise differences. The cat-owners expressed a more positive attitude toward outdoor cats in the Town (mean = 2.80, SD = 1.31) and Rural areas (mean = 2.93, SD = 1.32) than in the Forest (mean = 1.91, SD = 1.24). As shown in Figure 4, there were significant attitudinal differences toward outdoor cats inhabiting between cat-owners and non-owners in the Town and Rural areas, i.e., cat-owners showed a higher acceptance of outdoor cats than did non-cat owners (Town: t -value = 2.43, $df = 77.9$, p -value = 0.02; Rural: t -value = 2.80, $df = 78.4$, p -value < 0.01; Forest: t -value = 0.60, $df = 79.6$, p -value = 0.55).

434 **Table 3. The attitudinal differences in preferences for outdoor cats inhabiting between cat-**
 435 **owners and non-owners across areas**

The classification of respondents	Town	Rural	Forest	H ₀ : No attitudinal difference in the preferences for outdoor cats inhabiting across areas
All respondents	2.49(1.33) ^a	2.57(1.34) ^a	1.84(1.17) ^b	p-value < 0.01
Cat-owners respondents	2.80(1.31)	2.93(1.32)	1.91(1.24)	p-value < 0.01
Non-owners respondents	2.11(1.27)	2.14(1.25)	1.76(1.09)	p-value = 0.33
H ₀ : No attitudinal difference in the preferences for outdoor cats inhabiting between cat-owners and non-owners	p-value = 0.02	p-value < 0.01	p-value = 0.55	

436 ^{a-b}: Items used to develop the attitudinal scores and results of ANOVA to test for differences
 437 between respondents, using Tukey's HSD test, indicating differences among the cat habitat,
 438 p < 0.05; values followed by the same letter are not significantly different. The figure
 439 shows mean (±SD) of the preferences for each outdoor cat habitat based on 5-point Likert
 440 scale (1: strongly disagree–5: strongly agree).

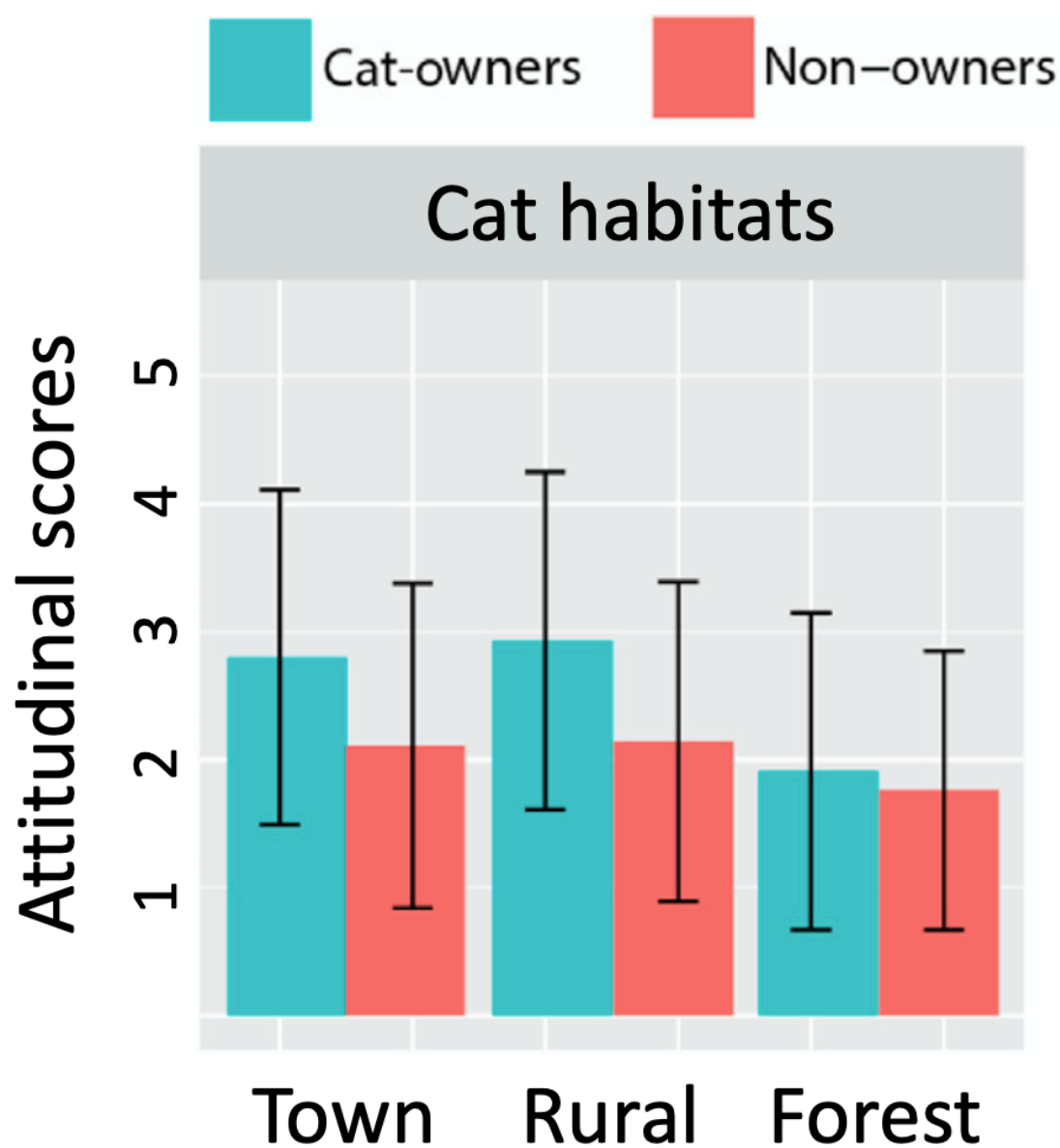


Figure 4. Comparison of average attitudinal scores with respect to preferences for each habitat of outdoor cat between cat and non-cat owners

Data was obtained using 5-point Likert scale (1: strongly disagree–5: strongly agree) and significant differences (values of mean and Tukey’s HSD test) are presented in Table 3.

Table 4 shows the average attitudinal scores toward each management strategy and their comparison between cat-owners and non-owners. There were no significant differences in the preference for each form of management among the areas (adoption: $F = 0.22$, $df = 2$, $p = 0.80$; TNR: $F = 0.87$, $df = 2$, $p = 0.42$; lethal options: $F = 0.56$, $df = 2$, $p = 0.57$). However, there were significant multivariate differences among the management strategies ($F = 95.69$, $df = 2$, $p < 0.01$). Adoption was the most supported management strategy among the three options (mean = 3.95, $SD = 1.43$), whereas lethal control was the least supported strategy (mean = 2.13, $SD = 1.46$). Overall, 70% of the respondents preferred adoption, followed by TNR (42%) and lethal control (21%). The majority of respondents preferred the adoption strategy across all areas (Figure 5).

456 **Table 4. The attitudinal differences in preferences for outdoor cat management strategies between cat-owners and non-**
457 **owners across areas**

Management options	The classification of respondents	Town	Rural	Forest	H ₀ : No attitudinal difference in the preference for outdoor cat management strategies across areas
Adoption	ALL	4.01 ^a (1.40)	3.96 ^a (1.40)	3.87 ^a (1.50)	p-value = 0.80
	Cat-owners	4.20 ^a (1.25)	4.11 ^a (1.27)	4.09 ^a (1.39)	p-value = 0.91
	Non-owners	3.78 ^a (1.55)	3.78 ^a (1.55)	3.60 ^a (1.61)	p-value = 0.84
H ₀ : No attitudinal difference in the preference for adoption between cat-owners and non-owners		p-value = 0.19	p-value = 0.31	p-value = 0.55	
TNR	ALL	3.21 ^b (1.47)	3.27 ^b (1.49)	2.98 ^b (1.53)	p-value = 0.42
	Cat-owners	3.56 ^b (1.45)	3.67 ^b (1.46)	3.27 ^b (1.59)	p-value = 0.43
	Non-owners	2.78 ^b (1.40)	2.78 ^b (1.40)	2.62 ^b (1.40)	p-value = 0.85
H ₀ : No attitudinal difference in the preference for TNR between cat-owners and non-owners		p-value = 0.02	p-value < 0.01	p-value = 0.05	
Lethal options	ALL	2.07 ^c (1.46)	2.05 ^c (1.42)	2.62 ^c (1.40)	p-value = 0.57
	Cat-owners	1.78 ^c (1.24)	1.78 ^c (1.24)	2.00 ^c (1.37)	p-value = 0.64

Non-owners	2.43 ^b (1.63)	2.38 ^b (1.57)	2.60 ^b (1.59)	p-value = 0.83
H ₀ : No attitudinal difference in the preference for culling between cat-owners and non-owners	p-value = 0.05	p-value = 0.06	p-value = 0.08	

458 ^{a-c}: Items used to develop the attitudinal scores and results of ANOVA to test for differences between respondents, using
459 Tukey's HSD test, indicating differences among the management options, $p < 0.05$; values followed by the same letter are not
460 significantly different. The figure shows mean ($\pm$ SD) of the preferences for outdoor cat management strategies based on 5-
461 point Likert scale (1: strongly disagree–5: strongly agree).

In all areas, the adoption of outdoor cats was the most desired management option, and lethal control was the least desired option among both cat-owners and non-owners (Table 4). Both cat-owners and non-owners preferred adoption, followed by TNR and lethal control; however, there are differences between them with respect to accepting TNR. That is, cat-owners preferred TNR as well as adoption in the Town and Rural areas; non-owners preferred neither TNR nor lethal control in all areas (Figure 5). I also compared the preferences of cat-owners and non-owners using a t-test. Table 4 shows that there were no significant attitudinal differences toward adoption between cat-owners and non-owners across all areas (Town: $t\text{-value} = 1.32$, $df = 68.9$, $p\text{-value} = 0.19$; Rural: $t\text{-value} = 1.03$, $df = 69.3$, $p\text{-value} = 0.31$; Forest: $t\text{-value} = 1.48$, $df = 71.4$, $p\text{-value} = 0.14$). However, the attitudinal scores toward TNR and lethal options were significantly different between cat-owners and non-owners (Figure 5). Cat-owners had a significantly higher acceptance toward TNR in the Rural area than did non-owners ($t\text{-value} = 2.79$, $df = 78.1$, $p < 0.01$); they also had a lower acceptance toward lethal options in the Town area than did the non-owners ($t\text{-value} = -2.014$, $df = 66.3$, $p = 0.05$). Figure 6 summarizes the attitudinal differences between cat-owners and non-owners.

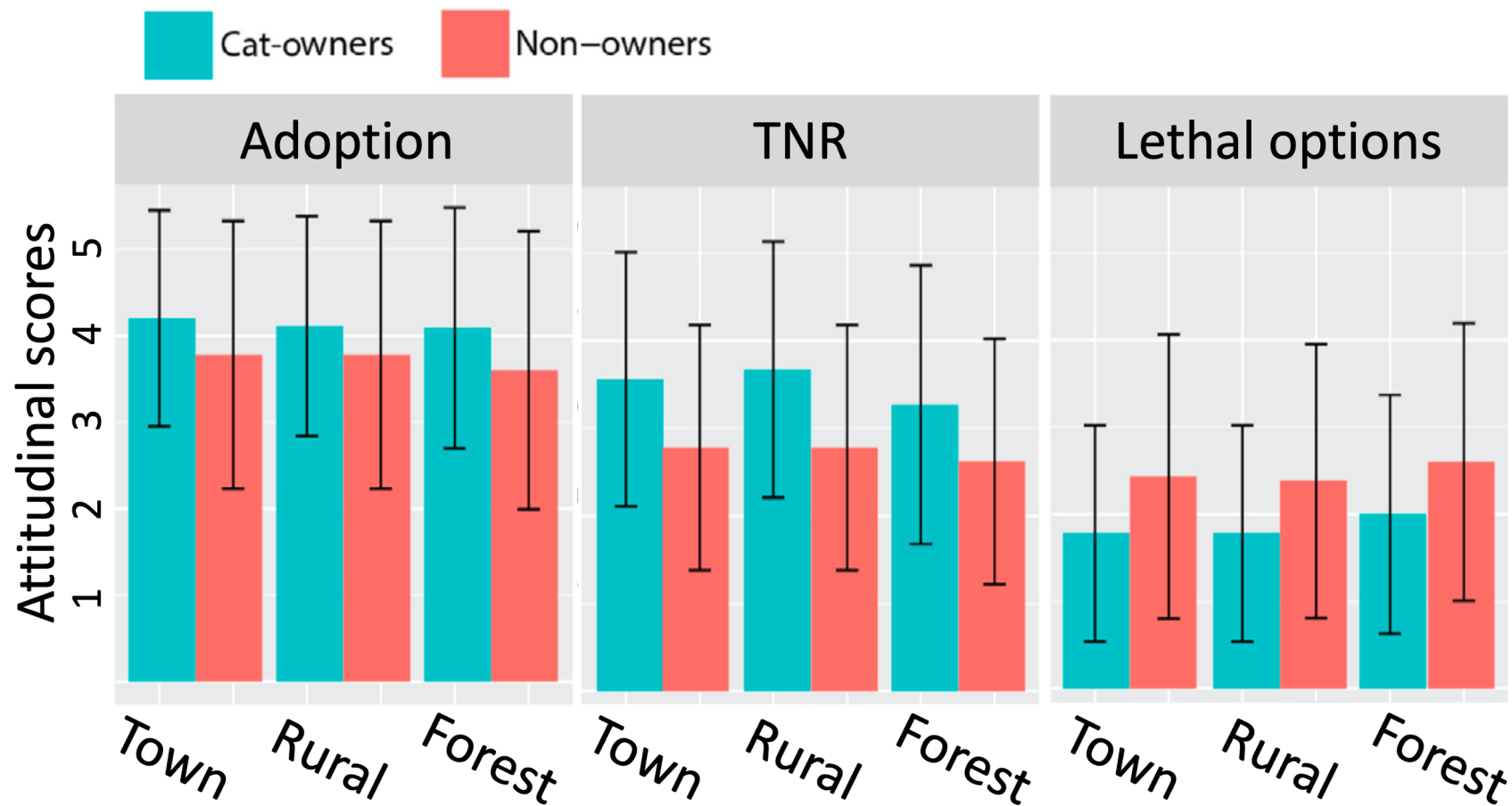
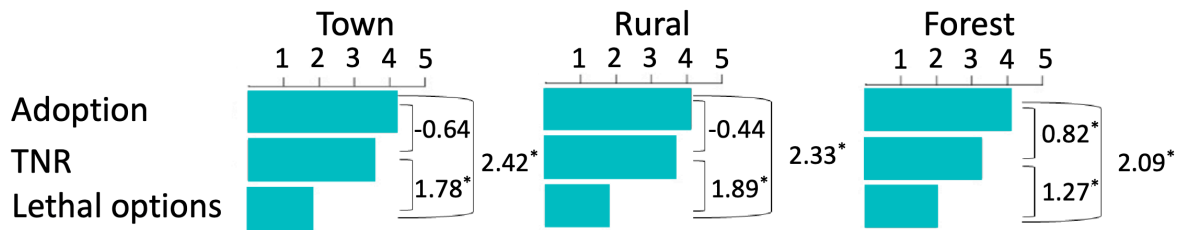


Figure 5. Comparison of average attitudinal scores with respect to preferences for outdoor cat management methods between cat and non-cat owners in each outdoor cat habitat

Data was obtained using 5-point Likert scale (1: strongly disagree–5: strongly agree) and significant differences (values of mean and Tukey's HSD test) are presented in Table 4.

Cat owners' attitudinal differences toward outdoor cat management



Non-owners' attitudinal differences toward outdoor cat management

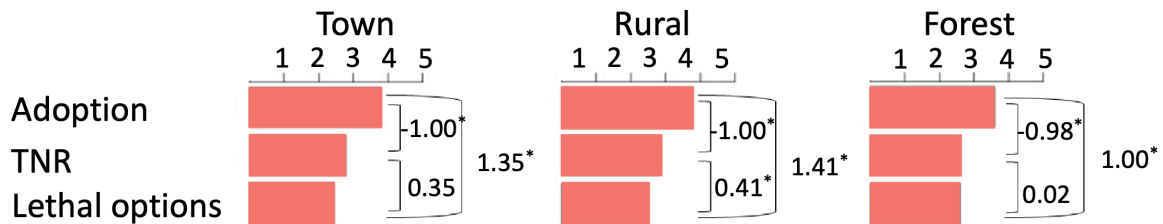


Figure 6. Cat-owners and Non-cat owners' attitudinal differences toward outdoor cat management

*: p-value < 0.05

2.3 Discussions

On average, residents were more averse to outdoor cat in the Forest than in the other areas (Table 3). This implies that residents supported the elimination of outdoor cats from the Forest areas that have substantial endemic and endangered species. Although Hall et al. (2016) have indicated that Japanese people, especially those living in urban areas, regard outdoor cats as harmless to wildlife anywhere, the people who have interactions with nature, such as island residents, may be aware of the negative impact of outdoor cats on ecosystems (Medina & Nogales, 1996). In addition, cats on Amami Oshima have been known to prey on endangered animals (Shionosaki et al., 2015), and publicity about these findings may have increased awareness among local residents about the ecological impacts of outdoor cats.

On the other hand, the residents were more accepting of outdoor cats in the Town and Rural areas because most residents enjoyed seeing cats (Lohr & Lepczyk, 2014) and forming an attachment with them in seeking companionship, and as a method of pest control. Their perceived benefits of cats in the Town and Rural areas were higher than in the Forest. This indicates that cats, even outdoor ones, are important companion animals and pets for people. However, the kind of impact that they have on residents seems different across areas. For example, people might feel comfortable with outdoor cats when they inhabit spaces in their neighborhood, whereas, they might perceive fewer benefits of cats when they live away from the residential areas (i.e., the Forest). This is in contrast to the public's attitude toward large carnivores. For example, people show "Not-In-My-Back-Yard" (NIMBY) attitudes toward bears (e.g., Kubo & Shoji, 2014; Linas & Martynas, 2012).

Furthermore, these attitudinal differences toward outdoor cats inhabiting in each areas were more apparent for cat-owners than for non-owners. This indicates that the benefits of having

cats, such as developing companionship with them or using them to control pests, were recognized at a substantially higher level by cat-owners than non-owners. Cat-owners could be also more attached to cats and worried about the implications of management on owned cats. That results are derived from their personal experience of owning cats, which can make it difficult for them to extrapolate to the predatory nature of cats having an impact on wildlife. Owned cats can go from the owners' homes and hunt endangered species (Beckerman, Boots, & Gaston, 2007; Loyd, Hernandez, Carroll, Abernathy, & Marshall, 2013). Thus, I need some measures to persuade cat-owners to keep the cats within their homes on islands, because the impact of owned cats could be extensive.

Findings support the zoning management which outdoor cats in the Forest would primarily be eliminated. Residents' attitudes toward outdoor cats inhabiting differed between the Forest area and others. Therefore, I conclude that residents agree upon the implementation of intense management and elimination of outdoor cats in the Forest. Since there could be conflicts over the management in both the Town and Rural areas, communication such as information provision about the risk of outdoor cats is essential to fill the attitudinal gaps and foster effective outdoor cat management.

I also found that the residents' preferences for cat management did not differ across areas, which is different from the findings on outdoor cats inhabiting (Table 4). Interestingly, lethal control was not accepted as an option even in the Forest, where acceptance of outdoor cats inhabiting was relatively low. In all three areas, the residents preferred non-lethal management of outdoor cats: adoption was the most supported strategy, and lethal control was the least preferred option. This could be due to religious background, because Japanese people generally are less accepting of the taking of life, even of invasive species, than are people in countries, such as New

Zealand and Australia, which conduct the lethal management of outdoor cats (Nogales et al., 2004). The findings implied attitudinal differences concerning the non-lethal options for outdoor cats between Japan and other countries.

The results also showed the differences in the preference for cat management between cat-owners and non-owners. In particular, it is interesting that the non-owners had a more negative attitude toward TNR than did the cat-owners. Since the non-owners do not accept outdoor cats inhabiting in Town and Rural areas, they do not prefer the TNR option of returning the cats to their habitats. In fact, author found the conflicts between cat-lovers and cat-haters through interview survey to the Amami City officers and residents in an explanatory meeting for TNR. Considering that TNR is encouraged in Town and Rural areas in the Amami Oshima Island, the government administrators need to talk with non-owners, with the aim of filling the gap between non-owners' preferences and the current policies. Communication with non-owners about the cats' potential habitat range can help them to understand the current policies. On the other hand, cat-owners had a low acceptance of lethal options and a high support for TNR. This implies that cat-owners preferred that the outdoor cats remain on the island. Therefore, using TNR could cause a conflict between cat-owners and non-owners in the Town and Rural areas. Since previous studies (e.g., Dabritz et al., 2006; Lohr & Lepczyk, 2014; Wald & Jacobson, 2013) have also pointed that TNR can cause conflicts among residents, it is important to include the cat-owners and non-owners in the decision-making process, for the effective management of outdoor cats. Although adoption was the most supported option among both cat-owners and non-owners, it could include the challenges in the budget and human resource constraints.

Chapter 3. Evaluating tourists' willingness to support for cat management on Amami Oshima Island.

This chapter aims to address third research question, i.e.,

- III. How much are tourists willing to financially support the current outdoor cat management strategy of using a non-lethal option on the island?

I evaluated tourists' willingness to financially support outdoor cat management on Amami Oshima Island. On Amami Oshima Island, tourists are important stakeholders because nature-based tourism supports the local economy, which contributes to biodiversity conservation. Therefore, understanding their willingness to support outdoor cat management plays an essential role in the development of an effective outdoor cat management strategy.

Although chapter 2 found that the residents living in Amami Oshima Island preferred the outdoor cat management by Adoption, the costs of using non-lethal options are often higher than the costs of using lethal options. Thus, securing financial resources is one of the biggest challenges in the management of invasive species, including cats (Campbell et al., 2011; Gardener, Atkinson, & Rentería, 2010; Simberloff, Parker, & Windle, 2005). A large proportion of funding for environmental conservation is derived from the public, and environmental conservation must therefore compete with other public-sector services such as education and health care (Anand, 2004; James et al., 1999). Consequently, the budget for conservation tends to be limited. Philanthropic measures, such as donations, have been considered an essential tool for success (Chao & Lin, 2017; Dunn et al., 2018; Gaertner et al., 2016).

Despite the general agreement that budget shortages have prevented non-lethal outdoor cat management (Campbell et al., 2011; Ministry of the Environment, 2018), few studies have addressed the potential for monetary support from citizens for the management of cats. One of

the most relevant studies to the present study is Subroy et al. (2018) who revealed that the invasive species management relying on only lethal baiting is not preferred, and they concluded that a combination of management strategies should be implemented. The reason for their conclusion was mainly based on cost-effectiveness, but they also implied that there are possible effects of negative perceptions and preferences for lethal baiting (Subroy et al., 2018). However, little is known about the public willingness to provide monetary donations for management using options that minimize conservation conflicts.

The purpose of the present study was to assess the intentions of tourists to provide a monetary donation for outdoor cat management that uses the adoption approach. It notes that, in only this chapter, I conducted the survey by focusing on outdoor cats inhabiting the Forest area, referring to the current policy. Tourists are one of the most important stakeholders on Amami Oshima Island in Japan because local communities, especially those around protected areas, depend on revenue from tourism. Moreover, previous studies have indicated that utilizing tourist support can overcome challenges associated with shortages of human and financial resources for invasive species management (Chao & Lin, 2017; Mameno et al., 2020). In fact, environmental managers, such as MoE and local government in Amami Oshima Island case, request support from citizens who do not live on the island to overcome budget constraints and shortages of new cat owners. To the best of my knowledge, no studies have addressed voluntary financial commitments to non-lethal invasive species management strategies. The present study helps to address this knowledge gap here.

I also assessed factors affecting tourist intentions to donate funds. Previous studies concerning the willingness to pay (WTP) and intentions to support invasive species management (e.g., Bremner & Park, 2007; García-Llorente et al., 2011; Mwebaze, MacLeod, Tomlinson,

Barois, & Rijpma, 2010; Nishizawa, Kurokawa, & Yabe, 2006) have found that socio-demographic factors, including age, sex, and income, affected support (Bremner & Park, 2007). For example, elderly and high-income people have a higher WTP for invasive species management (García-Llorente et al., 2011). These studies also showed the effects of attitudes toward the environment, invasive species, and their management on WTP (Bremner & Park, 2007; Nishizawa et al., 2006). Nishizawa et al. (2006), for example, showed that people who think invasive species should be reduced tend to have a higher WTP. On the other hand, people who are familiar with the environment where invasive species live tend to have a lower WTP. By revealing the effects of respondent characteristics, the present study can provide useful insights into public support for outdoor cat management. This work also extends the literature regarding voluntary conservation approaches. A few studies have focused on such approaches (Mameno et al., 2020; Morzillo & Needham, 2015).

3.1 Methods

3.1.1 Survey and questionnaire design

I conducted a questionnaire that mainly included questions concerning four issues (Appendix 3). First, respondents were asked about their attitudes toward reducing outdoor cat populations, regardless of the management method. Second, respondents were asked about their attitude toward management options (adoption and lethal options). Third, they were asked about their willingness to donate to outdoor cat management that applied adoption as a non-lethal option. Finally, questions asked about individual characteristics. Regarding the former two aspects, respondents were asked their attitudes using 5-point scales.

To assess WTP, we applied the contingent valuation method (CVM) using a payment card-type questionnaire (Martín-López, Montes, & Benayas, 2007; Mwebaze et al., 2010;

624 Nishizawa et al., 2006). The CVM was originally a tool for determining the value of
625 environmental goods. In the CVM, respondents were presented with a scenario that included a
626 hypothetical improvement of an environment and asked the maximum amount of money they
627 would be willing to pay to achieve this scenario (Loomis & duVair, 1993; Walsh, Loomis, &
628 Gillman, 1984). The concept of the CVM was created by Ciriacy-Wantrup (1947) and the first
629 empirical study was conducted by Davis (1963). The payment card-type questionnaire listed a
630 range of JPY amounts (JPY at 100 is converted to the dollar [USD]), including zero, from which
631 a respondent selected their willingness to donate (Figure 7). Each respondent was asked to
632 answer the payment-type questionnaire only once.

As shown in the figure, there are some costs associated with the implementation of the adoption approach, such as "Cat capture costs", "Operating costs of facilities housing cats until new owners are found", and "Transportation costs for the transfer to new owners".



If you are asked to support cat management using an adoption approach, how much will you contribute to such management? Please select the value closest to the amount you can donate and circle it.

! Please note that donated funds will reduce the amount of your money available for other uses.

①0 JPY (Non-donation) ②100 JPY ③200 JPY ④300 JPY ⑤400 JPY ⑥500 JPY
 ⑦600 JPY ⑧700 JPY ⑨800 JPY ⑩900 JPY ⑪1000 JPY ⑫1500 JPY
 ⑬2000 JPY ⑭Over 3000 JPY (JPY)

* That is translated from Japanese into English

Figure 7. Sample of the payment card-type question presented actually to respondents

Although the dichotomous choice option in CVM studies seems to be the most popular approach and is also the one recommended by the National Oceanic and Atmospheric Administration (NOAA) panel (Arrow et al., 1993), some studies have indicated that the payment card approach is superior in terms of estimating conservative WTP amounts compared to the dichotomous choice option in any situation (Blaine, Lichtkoppler, Jones, & Zondag, 2005; J. Loomis et al., 2018; Ryan, Scott, & Donaldson, 2004). Specifically, when the sample size is relatively small, the payment card approach is more appropriate (Hanemann, Loomis, & Kanninen, 1991).

3.1.2 *Data Collection and Analysis*

I randomly distributed questionnaires to Japanese visitors at Amami Airport on Amami Oshima Island from August 12 to 15, 2016. The reason I only targeted Japanese visitors was the limited number of foreign tourists. A total of 1,000 questionnaires were distributed. Of these, 340 questionnaires were returned by mail (34% response rate). For our analysis, I used the data from the 317 respondents who answered all relevant questions (23 respondents were excluded because I could not retrieve data about their intention to donate and other data). The socio-demographics of respondents are summarized in Table 5. Approximately half of respondents were male ($n = 153$). The most represented age group was between 40 and 49 years of age ($n = 103$), followed by 30 to 39 years of age ($n = 77$). The number of respondents who had not visited the island before was 186 (59%).

659 **Table 5. Sociodemographic characteristics of the respondents**

Characteristics	
Sex	Male: 153 (48%), Female: 164 (52%)
Age	10-19: 8 (3%), 20-29: 55 (17%), 30-39: 77 (24%), 40-49: 103 (33%), 50-59: 60 (19%), 60-69: 11 (3%), over 70: 3 (1%)
Times visiting the island	1 st time: 186 (59%), 2 nd time: 30 (9%), 3 rd time: 16 (5%), 4 th time: 7 (2%), 5 th time: 15 (5%), 6 th time and more: 62 (20%), unknown: 1

660

661 To estimate tourist intentions to donate to non-lethal outdoor cat management, the median
662 and mean of the willingness to donate were calculated. To identify the characteristics of
663 respondents who were more or less willing to donate, the function of intent to donate was
664 estimated with a Tobit regression model and nine explanatory variables (Bremner & Park, 2007;
665 García-Llorente et al., 2011; Mwebaze et al., 2010; Nishizawa et al., 2006). I assumed that the
666 choice of 0 JPY was a legitimate choice based on a lack of intention to donate (Wooldridge,
667 2002). Table 6 shows the details of variables used in the analysis. Results of the Tobit regression
668 model were estimated by the VGAM package in R (Yee, 2020; R Core Team, 2019).

669 **Table 6. Description of the variables used in the Tobit model**

Variables		Mean	SD
WTP (Response variable)	Respondents' willingness to pay for non-lethal cat management in Amami Oshima Island	1187	2459
Env-Forest	Dummy variable indicating whether the respondents considered forests to be an important area on Amami Oshima Island: Yes is 1, No is 0	.7855	.4111
Env-Farmland	Dummy variable indicating whether the respondents considered farmland to be an important area on Amami Oshima Island: Yes is 1, No is 0	.3028	.4602
Rare species viewing	Willingness to view the rare species on Amami Oshima Island, such as Amami rabbits: "Not interested (=1)" to "Interested (=5)"	3.659	1.033
Cat viewing	Dummy variable representing whether the respondents have seen outdoor cats during their visit to Amami Oshima Island: Yes is 1, No is 0	.3281	.4703
Atti-Adoption	Attitude towards outdoor cat management by the adoption approach on Amami Oshima Island: "Undesirable (=1)" to "Desirable (=5)"	3.751	1.127
Atti-Lethal	Attitude towards outdoor cat management by the lethal option on Amami Oshima Island: "Undesirable (=1)" to "Desirable (=5)"	2.170	1.218
Male	Dummy variable representing the respondents' gender: Male is 1, Female is 0.	.5174	.5004
Age	Variable indicating the respondents' age: from 10 (=1) to over 70 (=7)	3.621	1.199
Income	Variable indicating annual household income: under 2 million JPY (=1) to over 18 million JPY (=10)	4.530	2.711

670 * In this table, the JPY at 100 is converted to the dollar (USD)

3.2 Results

More than half of respondents agreed that the number of outdoor cats should be decreased, and a few (14%) agreed with the use of lethal cat management. In contrast, 62% of respondents agreed with management using the adoption approach (Atti-Adoption). Furthermore, 87% of respondents showed a willingness to donate to outdoor cat management, and their mean willingness to donate was 1187.7 JPY (about USD \$11.87; median = 500.00 JPY, $SD = 2459.6$). In addition, the mean willingness to donate calculated excluding rejected answers (i.e., 0 JPY) was 1374.1 JPY (about USD \$13.74). The median willingness to donate was 1000 JPY (about USD \$10.00; $SD = 2597.2$).

The estimated results of the Tobit model are presented in Table 7. The coefficients of five variables were statistically significant at the 5% level. The coefficient of the variable referring to the attitude towards lethal cat management (Atti-Lethal) was negative (Coefficient = -341.17, S.E. = 134.79), and the coefficients of the dummy variable indicating whether the respondents considered forests to be important areas (Env-Forest; Coefficient = 1362.6, S.E. = 337.61), the respondents' willingness to view rare species (Rare species viewing; Coefficient = 380.90, S.E. = 150.85), the dummy variable representing whether the respondents had seen outdoor cats during their visit (Cat viewing; Coefficient = 662.37, S.E. = 325.36), and income (Income; Coefficient = 197.49, S.E. = 58.927) were positive. The coefficients of other variables in the model were not significant.

690 **Table 7. Estimation results from the Tobit model**

Variables	Coefficient	Std. Error	P> z
Env-Forest	-225.97	390.67	0.5630
Env-Farmland	1362.6	337.61	0.0000
Rare species viewing	380.90	150.85	0.0116
Cat viewing	662.37	325.36	0.0418
Atti-Adoption	175.62	140.55	0.2115
Atti-Lethal	-341.17	134.79	0.0114
Male	211.69	312.37	0.4980
Age	115.42	136.31	0.3971
Income	197.49	58.927	0.0008
(Intercept 1)	-2493.1	1063.9	0.0191
(Intercept 2)	7.8141	0.0537	0.0000
Number of Fisher scoring iterations	18		
Log likelihood	-2560.749		

691 * See Table 6 for the details of variable names

3.3 Discussions

To compare results of the present study to the previous relative study (e.g., Mwebaze et al., 2010; Nunes & Van Den Bergh, 2004; Subroy et al., 2018), the following discussion is based on the WTP results and excludes respondents who answered 0 JPY. As a result, 87% of respondents had an intention to donate and the mean of their willingness to donate was 1374.1JPY (about USD \$13.74). Considering that more than 300,000 tourists visited Amami Oshima Island in 2016 (Kagoshima Prefecture, 2020), results of the present study suggest that over 260,000 people may be willing to donate funds to outdoor cat management that uses the adoption approach, and approximately 358 million JPY (about USD \$3.58 million) could be collected from their monetary donations. Moreover, the number of visitors will continue to increase in the future, although the recent COVID-19 pandemic might significantly change the tourism industry. Based on the current management costs of about USD \$460,000, the present study suggests that monetary donations by tourists may be sufficient to support the non-lethal outdoor cat management program. Utilizing tourist financial support may have a significant positive effect on outdoor cat management. I demonstrate the feasibility of financial commitment from tourists for invasive species management in addition to the context of lethal management (Malpica-Cruz, Haider, Smith, Fernández-Lozada, & Côté, 2017; Mameno et al., 2020). The results of this study also show that the rate of respondents who were willing to donate was about twice as high as those found in previous studies (Mwebaze et al., 2010; Nunes & Van Den Bergh, 2004), but the mean amount of money they were willing to donate was about half as high (Mwebaze et al., 2010; Subroy et al., 2018). The different results could be derived from differences in the status of conservation target species and control strategies (Subroy et al., 2018).

The present study also investigated factors affecting the intention to donate to outdoor cat management using a non-lethal option. Results showed that attitudes toward lethal options

are a significant predictor of the intent to donate. This is consistent with theories suggesting that attitudes predict behavioral intentions (Ajzen & Fishbein, 1980). This finding indicates that the method used for managing outdoor cats is a key factor in obtaining people's financial commitment, which is similar to the results of Subroy et al. (2018). Results also show that respondents with relatively high incomes had a higher intention to donate than did those with lower incomes, which is consistent with results of a previous study involving the CVM (McIntosh, Shogren, & Finnoff, 2010). One interesting finding is that respondents who consider farmland (Env-Farmland), rather than forest, as a critical environment on Amami Oshima Island had a higher intention to donate. These results support a previous study that uncovered the effects of knowledge and attitudes toward WTP for invasive species management (García-Llorente et al., 2011). There is the unique belief among Japanese people about cats and their impacts on wildlife. A previous study indicated that Japanese people tend to believe that cats have fewer impacts on wildlife compared with what residents of other countries believe (i.e., UK, USA, Australia, New Zealand, China; Hall et al., 2016). The results might also be related to knowledge gaps regarding the impacts of cats living in farmlands, including the occurrence of infections transmitted by cats, such as toxoplasmosis (Glen et al., 2019; Nutter et al., 2004; Tenter, 2009).

Tourism, especially nature-based tourism, often places a burden on environmental resources that are important for local economies around protected areas (Geffroy, Samia, Bessa, & Blumstein, 2015). Amami Oshima Island is expected to be designated as a natural World Heritage site in the near future. Such designations lead to increased tourist numbers, and the associated increase in tourist impacts may deteriorate the natural resources (Larson, Reed, Merenlender, & Crooks, 2016; Rogala et al., 2011). However, respondents who were willing to view rare species tended to report a high willingness to donate and such donations contribute to the implementation of effective outdoor cat management strategies. Considering

that management increases the population of rare species and the chance of watching rare species, utilizing tourist financial support can also increase the local benefits from wildlife viewing tours (Kubo, Mieno, & Kuriyama, 2019).

Findings provide useful information for outdoor cat management on Amami Oshima Island. It is urgent to manage outdoor cats on this island to conserve endangered species and secure the island's designation as a natural World Heritage site (e.g., Ministry of the Environment, 2019). However, according to chapter 2, lethal cat management was not accepted by residents. This criticism leads to conservation conflicts among stakeholders, which is one of the drivers delaying the implementation of conservation strategies. The present study shows that tourist donations have the potential to enhance outdoor cat management implementation while helping to minimize conservation conflicts (Chapter 2; Loyd & Miller, 2010a, 2010b; Wald & Jacobson, 2013). Moreover, the findings may be applied to other residential islands. For example, using the option of capturing and adopting may help to avoid conflicts among some stakeholders in Hawaii. Despite Hawaii having one of the highest acceptance rates for using lethal options, at least one group (animal welfare organizations) disapproves the use of lethal options, which could lead to conflicts (Lohr & Lepczyk, 2014). In New Zealand, although the public accepts the lethal option for outdoor cats, their support for the lethal option for stray cats is lower (Glen & Hoshino, 2020). Considering that the adoption approach can receive broader social acceptance compared to lethal control or TNR (Glen & Hoshino, 2020; Loyd & Hernandez, 2012), involving tourists and obtaining their financial support for outdoor cat management enables implementation of management strategies without any conflicts preventing the application of more effective management efforts on islands.

Finally, the valuation method with stated preferences has been the subject of criticism due to potential biases (Martín-López et al., 2007; Murphy, Allen, Stevens, & Weatherhead,

2005) and previous valuation studies revealed that the actual behaviors (i.e., actual monetary donations) were sometimes different from the intention to donate and/or the WTP, which is considered to be a hypothetical bias (Hanley & Czajkowski, 2019; Harrison & Rutström, 2008). Harrison and Rutström (2008) reviewed 39 stated-preference method papers and found that the mean bias was approximately 300%. Moreover, the higher the stated value of the goods, the bigger the bias (Murphy et al., 2005). Other studies to address bias have indicated that the value of goods estimated by the stated preference methods is lower than the value estimated by revealed preference methods and actual donating behaviors (Brander & Koetse, 2011; Macmillan, Smart, & Thorburn, 1999). Although there is also evidence that 80% of respondents provide consistent values in actual behavior (Champ & Bishop, 2001), hypothetical bias increases the reluctance among policymakers to apply results of stated preference when implementing policies. To solve this problem, field experiments related to nature conservation have recently received much attention (e.g., Kubo, Shoji, Tsuge, & Kuriyama, 2018) because field experiments enable researchers to examine real-world contexts (Harrison & List, 2004). Therefore, findings from field experiments are critical and provide comprehensive information to policymakers. Further studies are needed to investigate actual behaviors related to donations in real-world contexts.

Chapter 4. Evaluating citizens' preferences for multiple goals of outdoor cat management plans using best–worst scaling techniques

This chapter aims to address the last two research questions, i.e.,

IV. Which goals, among biodiversity conservation, maintenance of a sanitary environment, prevention of zoonotic disease, and cat welfare, do citizens prioritize with respect to outdoor cat management?

V. Does the provision of information provision affect citizens' social preferences and their prioritization of outdoor cat management goals?

I evaluate citizens' preferences for multiple outdoor cat management goals and discuss the priority of the goals of outdoor cat management in Japan. We also assess the impacts of information provision relating to cats' predation and their welfare on citizens' preferences because cat management relies heavily on information provision and on communication. As a result of the work presented in Chapter 2, I found that outdoor cat management in towns and rural areas has the potential to lead to conservation conflicts between residents; this implies that, to increase outdoor cat management in biodiversity hotspots in Japan, it is necessary to explore means to build consensus and/or increase public support for outdoor cat management. Previous studies have shown that social preferences for invasive species management depend on the context and are affected by the provision of information (Ford-Thompson et al., 2012; Mameno et al., 2020; McLeod et al., 2017). Therefore, I investigated which outdoor cat management goals garnered the greatest public support and the impact of the provision of information on citizens' preferences.

In Japan, outdoor cat management has been conducted to achieve improvement in human well-being through solving the above issues, e.g., biodiversity loss, sanitary environment degradation, zoonotic diseases epidemic, and cats' welfare degradation. Recent

evidence shows that areas that are not among the hotspots nonetheless may affect biodiversity maintenance, and biodiversity losses in such areas therefore may be attributed to cats (Lepczyk et al., 2004). People living in and around biodiversity-rich areas also desire outdoor cat management for human welfare in residential areas (Suzuki, Mameno, & Kubo, 2017). Recently to achieve several goals of outdoor cat management are required; however, little is known about the social priority of the goals. Since the outdoor cat management has often faced challenges when attempting to balance multiple management goals, the prioritization in the management goals plays an essential role in the implementation of effective management.

To elicit general citizens' preferences for multiple outdoor cat management goals, I applied an Object case best–worst scaling (BWS) technique (Louviere, Flynn, & Marley, 2015). The application of BWS technique to invasive species management has been limited because of the relatively new approach (Finn & Louviere, 1992; Louviere et al., 2015). However, recently the number of studies that have applied BWS technique has been increasing within the context of ecosystems and environmental conservation, and BWS technique has been recognized as a useful tool to identify the relative importance of various policy issues to the public (e.g., Greiner, 2015; Kubo, Tsuge, Abe, & Yamano, 2018; Soto, Escobedo, Khachatryan, & Adams, 2018; Tsuge, Nakamura, & Usio, 2014; Tyner & Boyer, 2020). The publications have focused only on the ecosystem conservation dimension of invasive species management. The present study has investigated citizens' preferences among invasive species management goals while focusing on controversial outdoor cat management.

4.1 Methods

4.1.1 Best-Worst scaling and its design

BWS technique applied in this research was developed by Finn and Louviere (1992), and the objective case (Case 1) of BWS technique is suitable for the present study because, in the case, the alternatives are objects such as opinions and attitudes (Louviere et al., 2015). This

834 method is superior to other valuation methods, e.g. Likert scale (Louviere, Lings, Islam,
835 Gudergan, & Flynn, 2013). That is because the BWS technique elicits citizens' preferences
836 and uncovers clear differences among management goals by participants selecting the best
837 and worst alternatives from each choice set. As selecting the best and worst alternatives from
838 each of the choice sets, a clear difference tends to uncover among the management goals. For
839 example, consider a choice set of three goals from which a respondent chooses his or her
840 most and least preferred goals. The choice set consists of Goal A, Goal B, and Goal C of
841 invasive management, and the respondent prefers Goal A the most and Goal C the least. In
842 this case, I can obtain information about all possible paired comparisons (${}_3C_2 = 3$ pairs):
843 Goal A > Goal B, Goal B > Goal C, and Goal A > Goal C. BWS questions enable to
844 determine the rank of each management goal on the underlying latent scale.

845 The present study focuses on the following four categories of outdoor cat
846 management goals: biodiversity conservation, prevention of zoonotic diseases, maintenance
847 of sanitary environments, and preservation of cats' welfare. The biodiversity conservation
848 goal is implemented to prevent cat predation on wildlife; the prevention of zoonotic diseases
849 goal is implemented to protect humans from zoonotic diseases such as a Toxoplasma
850 infection; the maintenance of sanitary environments goal is implemented to get rid of the
851 issues caused by cats' excreta and their dispersing garbage; and the preservation of cats'
852 welfare goal is implemented to protect cats (including free-roaming pets) from traffic
853 accidents and infections such as Feline Immunodeficiency Virus (FIV). Although some
854 previous studies uncovered the lethal options are more preferred (Lohr & Lepczyk, 2014;
855 Subroy, Rogers, & Kragt, 2018), Glen and Hoshino (2020) showed that non-lethal option was
856 more preferred by Japanese and existing current methods of cat management strategies in
857 Japan. Based on the insights, I assumed using non-lethal options for cats' removal in the
858 BWS scenario.

859 Because results can be affected by the multiple-choice questions asked, an important
860 aspect of the BWS questions is determining what kinds of questions to present to
861 respondents. In this study, I employed Balanced Incomplete Block Designs (BIBD) to
862 compare against each of the goals (see Raghavarao & Padgett (2005) for details). The BIBD
863 enable to appear each alternative with the equal number of times and is equally compared
864 with each of the other alternatives across all choice sets. With application of BIBD, four
865 choice sets composed of three attributes were constructed in this study (Table 8). That is,
866 each management goal appeared three times across all choice sets and each pair appeared
867 once. In the BWS questions, respondents were asked to select the single most-desirable goal
868 and single least-desirable goal of outdoor cat management (Figure 8).

869 **Table 8. Conversion from BIBD to the Choice sets**

BIBD				Choice sets		
1	<u>A</u>	B	C	1	Biodiversity conservation	Prevention of zoonotic diseases
2	B	C	D	2	Prevention of zoonotic diseases	Maintenance of sanitary environment
3	C	D	<u>A</u>	3	Maintenance of sanitary environment	Preservation in cats' welfare
4	D	<u>A</u>	B	4	Preservation in cats' welfare	Biodiversity conservation

870 “A” appears in three choice sets on the left side (the first, the third, and the fourth choice set). In these three choice sets, “A” is
871 compared two times each against each of the other goals (i.e, “B”, “C”, and “D”).

872

Referring to previous studies (e.g., MacDonald et al., 2015; Mameno et al., 2020; Shannon et al., 2019), we divided the respondents into three groups to evaluate the impacts of information provision: those who answered the BWS questions without information provision (the control group; hereafter “control”), those who answered the BWS questions after reading ecological information on outdoor cats (the ecology treatment group; hereafter “ecology”), and those who answered the BWS questions after reading information on the risk posed by the outdoor cats’ welfare (the risk treatment group; hereafter “risk”). The ecology group was informed that outdoor cats pose substantial threats to biodiversity by preying on wildlife, including rare species. The risk group was provided the information that outdoor cats face serious risks, such as traffic accidents, cat fights, and viral infections (Table 9).

884 **Figure 8. Example of best–worst scaling questions used in this study.**

Comparing the three goals of outdoor cats management, which one do you agree with the most (or think is the best) and disagree with the most (or think is the worst) of the three management goals?

Questions. Please select one answer for each.

	The most desired management goal ↓	The worst desired management goal ↓
Maintenance of sanitary environment	☐	☐
Preservation in cats welfare	☐	☐
Biodiversity conservation	☐	☐

885

4.1.2 Econometric Analysis

In this study, we applied the maximum-difference model, which has often been used in previous research (Finn & Louviere, 1992). This model assumes that the questionnaire respondent identified what they consider to be the best and worst in any particular multiple-choice set of answers and thus chose the pair perceived to be the farthest apart in terms of “degree of desirability” (in case of this dissertation). If a multiple-choice set contains J items, then there are $J(J - 1)$ possible best–worst pairs from which the respondent can select. Then, the difference in desirability of items i and j may be represented by

$$Difference_{ij} = \beta_i - \beta_j + \varepsilon_{ij} \quad 1,$$

where β_i represents the desirability on an underlying latent scale of i items, and ε_{ij} represents the error component. The probability that a respondent will select items i and j from the multiple choice set as the best and worst is represented by the probability that $Difference_{ij}$ will be larger than $Difference_{kl}$, the differences between all other possible pairs in the multiple choice set:

$$\begin{aligned} P_{ij} &= \Pr(Difference_{ij} > Difference_{kl}) \\ &= \Pr[(\beta_i - \beta_j) - (\beta_k - \beta_l) > \varepsilon_{kl} - \varepsilon_{ij}] \end{aligned} \quad 2$$

Assuming that ε_{ij} is independent and has an identical Gumbel distribution, a conditional logit model can be derived. The reason why I applied the conditional logit model is that the model includes the effects of information provision on preference using interaction term variables. Although a mixed logit model, which can accommodate preference heterogeneity, is generally superior to the conditional logit model, the mixed logit model is not suitable to be applied when I seek the effects of interaction term variables. The probability P_{ij} that the respondent will select item i as the best and item j as the worst from J options is expressed as follows (Finn & Louviere, 1992):

$$P_{ij} = \frac{\exp(\beta_i - \beta_j)}{\sum_{k=1}^J \sum_{l=1}^J \exp(\beta_k - \beta_l) - J} \quad 3$$

The parameters can be estimated by the maximum likelihood method.

4.1.3 *Sampling Procedure*

I posted an online survey in the form of a questionnaire from November 17 to 28, 2016 (Appendix 1). The target for this survey was the nationwide registered prospective respondents of a survey company, which is considered to represent the general public in Japan. The invitation email was sent with consideration of age and gender in order to minimize the sampling bias. I received 1675 valid responses answering the BWS questions. Some key characteristics of different respondent groups (Table 9) are as follows. Among respondents of this study, almost half were male (808, 48.2%). The age groups 20s through 60s were almost evenly divided. The representative academic background (education level) was College/University graduate for 57.7% of respondents. Present or past cat owners numbered 544, of whom 196 (11.7%) had cats at the time of the survey. In the section of BWS questions, to evaluate the impacts of information provision, the respondents were randomly assigned to each group, i.e., control, ecology, and risk. The sample size of each of the three groups (control, ecology, and risk) was almost the same, and each group's characteristics were similar to those of the entire sample population of respondents.

927 **Table 9. Socio-demographic characteristics of respondents.**

	Control (<i>n</i> = 564)	Ecology (<i>n</i> = 522)	Risk (<i>n</i> = 589)
Information provided	None	“Outdoor cats catch wildlife, including endangered species. For example, in the Ogasawara Islands, cats prey on a rare bird, the red-faced spotted pigeon, which is listed as ‘Endangered’ on the International Union for Conservation of Nature's Red List of Threatened Species.”	“Outdoor cats face risks. For example, cats can be in a traffic accident, fight with another outdoor cat, or get infected with a virus. Feline immunodeficiency virus is especially prevalent in Japan, where nearly 30% of cats are infected with it.”
Gender	Male, 275; Female, 289.	Male, 256; Female, 266.	Male, 277; Female, 312.
Age	20s, 88; 30s, 129; 40s, 123; 50s, 96; 60s, 128.	20s, 78; 30s, 113; 40s, 118; 50s, 100; 60s, 113.	20s, 74; 30s, 117; 40s, 140; 50s, 106; 60s, 152.
Academic background (Education level)	Junior high school graduate, 9; Senior high school graduate, 126; Post-secondary technical school, 56; College/University graduate, 320; Master's/Ph.D. degree(s), 53.	Junior high school graduate, 5; Senior high school graduate, 136; Post-secondary technical school, 37; College/University graduate, 304; Master's/Ph.D. degree(s), 40.	Junior high school graduate, 6; Senior high school graduate, 132; Post-secondary technical school, 66; College/University graduate, 343; Master's/Ph.D. degree(s), 42.
Cat owner	Yes, 71; No, but have had a cat, 113; No, never had a cat, 380.	Yes, 60; No, but have had a cat, 120; No, never had a cat, 342.	Yes, 65; No, but have had a cat, 115; No, never had a cat, 409.

928

4.2 Results

Estimation results from applying the maximum-difference model are represented in Table 10. The coefficient for sanitary environment was set to zero for identification, and, thus, the estimated coefficients represent valuations relative to this variable. The coefficients for biodiversity conservation, zoonotic diseases, and cats' welfare were statistically significant at the 1.00% level, and those variables were estimated as significantly smaller than the sanitary environment (Figure 9).

937 **Table 10. Estimation results using the conditional logit model**

Variable	Coefficient	Standard Error	P > z
Biodiversity conservation	−0.508 ***	0.0385	0.000
Zoonotic diseases	−0.324 ***	0.0381	0.000
Sanitary environment	0	Set to zero	
Cats' welfare	−0.732 ***	0.0395	0.000
Effect of information provision on each parameter variable			
Ecology*: Biodiversity conservation	0.291 ***	0.0550	0.000
Ecology*: Zoonotic diseases	0.146 **	0.0547	0.008
Ecology*: Cats' welfare	−0.105	0.0578	0.070
Risk*: Biodiversity conservation	−0.0900	0.0540	0.096
Risk*: Zoonotic diseases	0.0344	0.0532	0.519
Risk*: Cats' welfare	0.0716	0.0550	0.193
Number of respondents	1675		
Number of observations	6700		
Log-likelihood	−11357.20095		
AIC/N	3.393		

938 * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3 shows the effect of information provision on each variable parameter. The ecological information impacted preferences positively toward biodiversity conservation (coefficient = 0.291; Standard Error (S.E.) = 0.0550) and toward prevention of zoonotic diseases (coefficient = 0.146; S.E. = 0.0547) but negatively toward preservation of cats welfare even though the coefficient is not statistically significant (coefficient = -0.105 ; S.E. = 0.0578). On the other hand, the interaction term variables of each alternative and the information on risk to cats in the outdoor environments were not statistically significant. Figure 10 also shows the percent of citizens that chose each attribute, among the four attributes. More specifically, the maintenance of a sanitary environment was the most frequently chosen attribute, with approximately 39% of respondents choosing it without the provision of information. On the other hand, the rate of selection of the biodiversity conservation attribute increased from 20 to 26% of respondents after ecological information had been provided. Similarly, the rate of selection of the cat welfare attribute increased from 15 to 16% of respondents after information about the inherent risks to outdoor cats was provided.

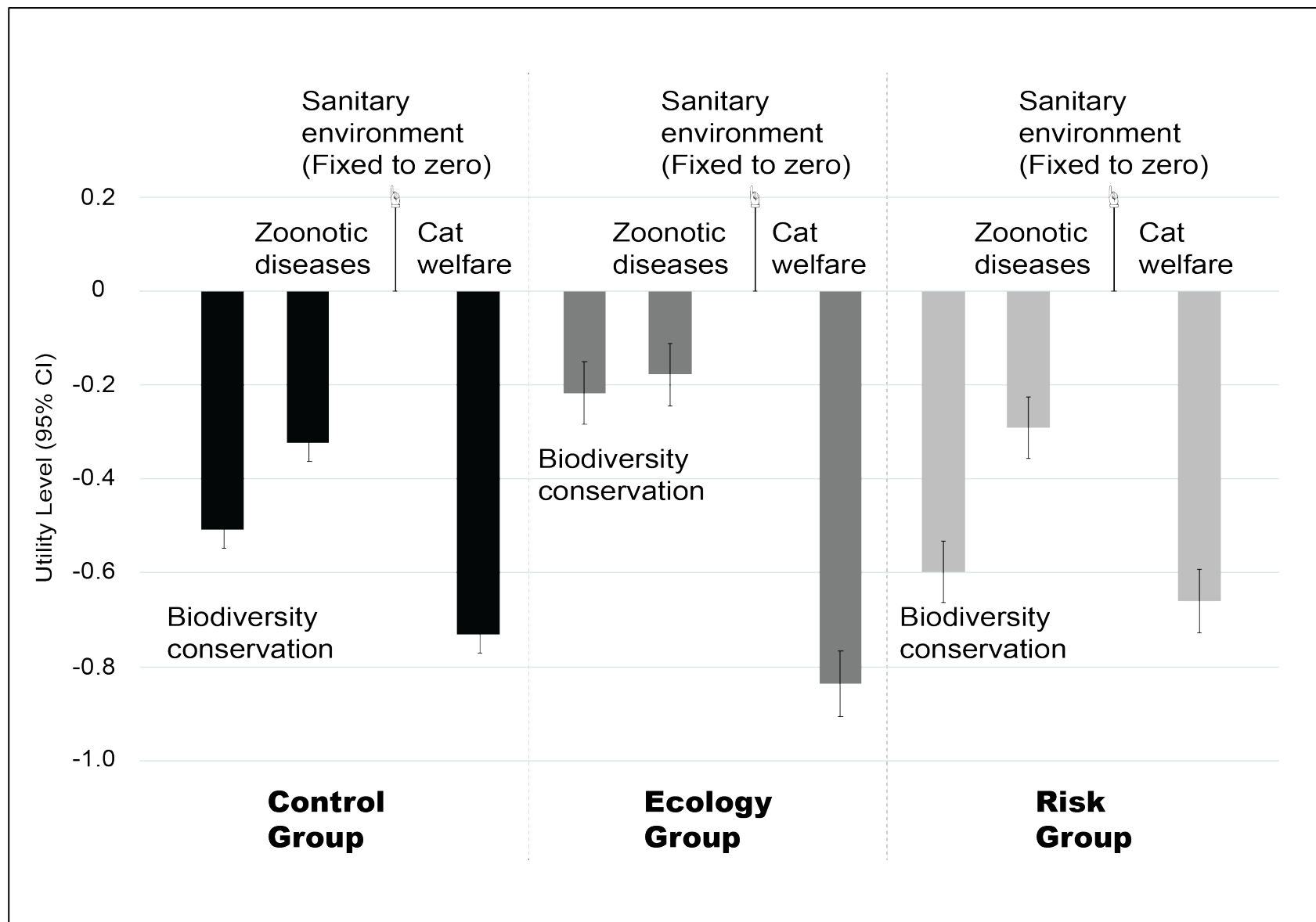
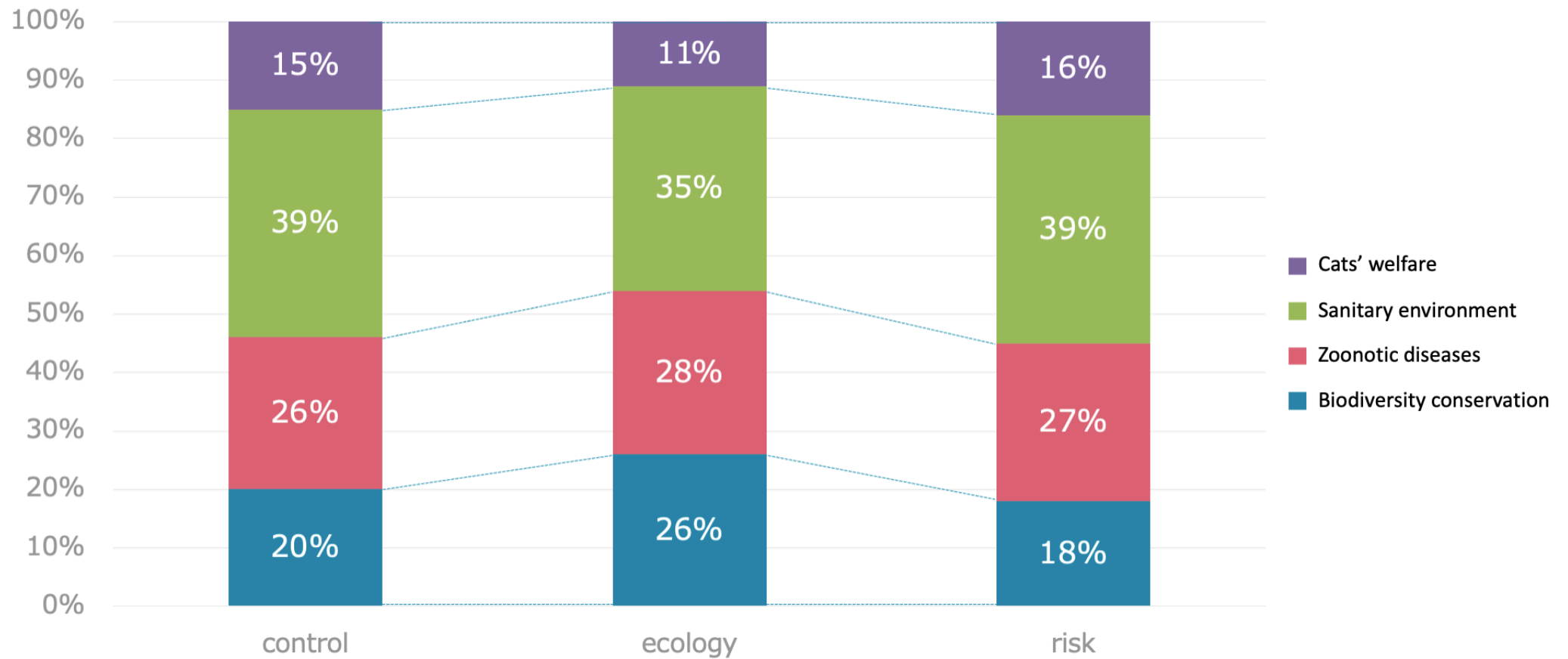


Figure 9. Maximum-difference model results of best–worst scaling for outdoor cat management goals.

The average utility in each group was calculated by using the interaction term variables of each alternative.



7

8 **Figure 10.** The rate of choice among four outdoor cat management goals in each group.

4.3 Discussions

The coefficients of biodiversity conservation and cat welfare preservation are significantly negative (Figure 9). This implies that the maintenance of a sanitary environment is a goal preferred by citizens. On average, the respondents considered that both cat welfare and biodiversity conservation were not top priority for outdoor cat management goals. The present study shows clear differences in citizens' evaluations of the management goals through their preferences using the BWS technique. In particular, a large difference was revealed among alternatives closely involving human lives (such as sanitary environment) and other alternatives (such as biodiversity conservation and animal welfare preservation). Findings are consistent with those of Hall et al. (2016), who indicated that the Japanese believe that cats are harmless to wildlife in all situations. They also showed that most cat owners in Japan, especially in urban areas, keep their cats inside at all times, and therefore Japanese people rarely see the outdoor cats. It is therefore possible that they have few opportunities to consider cat welfare by direct observation. Hence, the results also agree with the previous studies uncovering that people tend to prefer what is familiar and/or of direct concern like place attachment (Devine-Wright, 2009; Hernández, Carmen Hidalgo, Salazar-Laplace, & Hess, 2007; MacDonald et al., 2015; Suzuki & Ikeda, 2019).

Although the information effects are not large enough to reevaluate the ranking of the cat management goals, the provision of ecological information did statistically significantly impact respondents' preferences (Table 10). The respondents who received ecological information evaluated the conservation biodiversity as a more appropriate goal. The results are consistent with previous studies that show that the provision of ecological information had a positive impact on respondents' preferences regarding invasive species management, which influenced them to support biodiversity conservation (Mameno et al., 2020; Marzano et al., 2015). Ecological information provision has another interesting effect: even though it is

not statistically significant, the evaluation of preservation of cat welfare as an outdoor cat management goal is dropped² when respondents receive the ecological information. Although previous studies concerning biodiversity conservation show that ecological information is a useful tool encouraging public awareness of conservation (Mameno et al., 2020; Vane & Runhaar, 2016), our study suggests that such information should also value the dimension of animal welfare, in particular for invasive species derived from companion animals (Glen & Hoshino, 2020; MacDonald et al., 2015). On the other hand, provision of information about inherent risks of outdoor cats has little effect on respondents' preferences. The results are in contrast to previous suggestions that information about cats' risks outdoors can change people's, especially cat owners', behavior and/or attitude concerning cat management (MacDonald et al., 2015; Shannon et al., 2019). There are several possible explanations for this result, one being the unique culture in Japan; Hall et al. (2016) showed that cat owners who keep their cats indoors consider this as good manners. Furthermore, Japanese people often enjoy directly interacting with cats inside cat cafes, thus in indoor spaces (Hall et al., 2016).

Limited financial and human resources make it important for invasive species management to prioritize strategies and goals with consideration of citizens' preferences. Citizens' support for invasive species management plays an essential role in management success (Dunn, Marzano, Forster, & Gill, 2018; Gaertner et al., 2016; Lewis, Granek, & Nielsen-Pincus, 2019). However, previous studies addressing the prioritization of strategies and goals through social dimensions have been limited, while the present study highlights the importance of strategic invasive species management (Clout & Williams, 2009; Latham, Warburton, Byrom, & Pech, 2017; McNeely, 2001a). The findings suggest that

² In BWS technique, the results of coefficients of each variable are not independent, i.e., the evaluation of preservation of cat welfare is lower when the other goals are more evaluated. Therefore, we can not completely determine the reason why the evaluation of the preservation of cat welfare is dropped.

environmental managers, such as MoE and local government in Amami Oshima Island case, should implement cat management to maintain sanitary environments and prevent zoonotic diseases. In addition, the managers should communicate with stakeholders, i.e., information provision and education, to obtain citizen support and win an understanding of broader social and natural resources management goals, including biodiversity conservation. Given that conservation conflicts are a barrier to effective management, it is hard to accept biodiversity conservation goals (Figure 10). On the other hand, the managers can implement maintenance of sanitary environment goals with relative ease. However, as in the case of agricultural damage, citizens' support toward cat management can decline when cats' negative impacts on the sanitary environment are much lower. In cases of invasive mammals causing damage to such a primary industry, management is implemented only after the occurrence of damage, such as that affecting crops (Ikeda, Asano, Matoba, & Abe, 2004), and invoking control is difficult when the damage is low. That is because farmers become to be unconcerned with the damage when the damage is lower than their unacceptable level. Thus, in such cases, management acts only when the damage reaches a certain unacceptable level, with the purpose to prevent agricultural damage (Suzuki & Ikeda, 2019). It is, therefore, necessary to gradually shift management goals toward broader social and natural resources management, including biodiversity conservation while also addressing cats' welfare by using communications such as ecological information (Mameno et al., 2020). According to the analysis of information provided for residents on the Ogasawara Islands, the information provided by the local government has been gradually shifted from management of familiar issues with human lives to ecosystem management (Mitsui, Kubo, & Yoshida, 2018). Considering that outdoor cat management on the Ogasawara Islands is a good example of success, that shift can lead to effectively get citizen support.

Since I evaluate only general preferences, further research should address each stakeholder's preferences, such as cat-owners and non-owners, residents on the islands, and nature-based tourists. For example, a lot of previous studies uncovered the difference in attitudes toward cat management by cat owners and non-owners (e.g., Chapter 2; Wald et al., 2013). Although this study applied the conditional logit model because of the evaluation of information provision impacts, further research should also address this knowledge gap, preference heterogeneity, by using the mixed logit model and/or the latent class model (Louviere et al., 2015).

Chapter 5. Discussion

5.1 General discussion

Because of their invasion to native ecosystems, outdoor cats significantly contribute to biodiversity loss, especially on islands, which also leads to the degradation of human well-being. On the other hand, outdoor cats also provide benefits to people, such as companionship and pest management. Thus, the management of outdoor cats is controversial and can lead to conflicts among stakeholders. Although previous studies have examined stakeholders' preferences for outdoor cats and their management, studies about social preferences for outdoor cats and their management in Asia have been limited. Therefore, I investigated social preferences for cat management on Amami Oshima Island, Japan, a biodiversity hotspot, based on the following research questions:

- I. Do residents support the management of outdoor cats in each cat habitat, i.e., towns, rural areas, forests, on Amami Oshima Island?
- II. Which outdoor cat management options do residents prefer for each cat habitat on the island?
- III. How much are tourists willing to financially support the current outdoor cat management strategy of using a non-lethal option on the island?

Then, to explore manners through which to build consensus and/or increase public support for outdoor cat management, I evaluated citizens' preferences for multiple outdoor cat management goals. I also assessed the impacts of the provision of information relating to cat predation and cat welfare on citizens' preferences. This survey was conducted based on the following research questions:

- IV. Which goals, among biodiversity conservation, maintenance of a sanitary environment, prevention of zoonotic disease, and cat welfare, do citizens prioritize with respect to outdoor cat management?

V. Does the provision of information affect citizens' social preferences and their prioritization of outdoor cat management goals?

5.1.1 *Do residents support the management of outdoor cats in each cat habitat, i.e., Town, Rural, Forest, on Amami Oshima Island?*

I evaluated the residents' attitudes to outdoor cat inhabiting across habitats (Forest, Rural, and Town areas) on Amami Oshima Island. Furthermore, I compared the attitudes of cat-owners and non-owners. The residents showed less acceptance of outdoor cats in the Forest. This suggests that they agree with the need to eliminate outdoor cats from the Forest. On the other hand, the residents are more accepting of outdoor cats in the Town and Rural areas. This result may be explained by the fact that most stakeholders enjoy seeing cats (Lohr & Lepczyk, 2014) and forming an attachment with them in seeking companionship, and as a method of pest control. The results indicate that cats, even outdoor ones, are recognized as several benefits, such as important companion animals and pets for people. However, the kind of impact that they have on residents seems different across areas. For example, people might feel comfortable with outdoor cats when they inhabit spaces in their neighborhood, whereas, they might perceive fewer benefits of cats when they live away from the residential areas (i.e., the Forest). This is in contrast to the public's attitude toward large carnivores. For example, people show "Not-In-My-Back-Yard" (NIMBY) attitudes toward bears (e.g., Balčiauskas & Kazlauskas, 2012; Kubo & Shoji, 2014).

There are differences in preference for outdoor cats inhabiting between cat-owners and non-owners. Cat-owners show a significantly higher acceptance toward outdoor cats in Town and Rural areas than did non-owners. This indicates that the benefits of having cats, such as developing companionship with them or using them to control pests, are recognized at a substantially higher level by cat-owners than non-owners. Cat-owners could also be more attached to cats and worried about the implications of management on owned cats. A possible

explanation for this may be that their personal experience of owning cats, that make it difficult for them to extrapolate to the predatory nature of cats having an impact on wildlife. These findings support the government proposition in which outdoor cats in the Forest would primarily be eliminated.

The findings also imply the challenges relating to the charismatic invasive species, such as species developed as companion animals (Jarić et al., 2020). Chapter 5 points to citizens' desire to address problems that are more closely related to themselves. It implies common attitudes towards issues related to outdoor cats and the problems caused by large carnivores, i.e., the "Not-In-My-Backyard phenomenon" (Ericsson, Bostedt, & Kindberg, 2008; Kubo & Shoji, 2014). However, the results of chapter 2 indicate that local residents generally prefer that outdoor cats live in their neighborhood because they can provide a comfortable feeling to local residents. Thus, people can expect to deal with cat issues in their neighborhood while living with outdoor cats nearby.

5.1.2 Which outdoor cat management options do residents prefer for each cat habitat on the island?

Similarly, I evaluated the residents' attitudes to outdoor cat management across habitats and compared the attitudes of cat-owners and non-owners. Lethal options as a management strategy were unacceptable to the residents, whereas adoption was acceptable in all areas. Interestingly, lethal control was not accepted as an option even in the Forest where acceptance of outdoor cats inhabiting was relatively low. In all three areas, the residents preferred non-lethal management of outdoor cats, i.e., adoption, was the most supported strategy, and lethal control was the least preferred option. This could be due to religious background, because Japanese people generally are less accepting of the taking of life, even of invasive species, than are people in countries, such as New Zealand and Australia, which conduct the lethal management of outdoor cats (Nogales et al., 2004). Findings imply

1115 attitudinal differences concerning the non-lethal options for outdoor cats between Japan and
1116 other countries. The findings highlight the importance of case study in Asia.

1117 As well as the preferences for outdoor cats inhabiting, there are differences in
1118 preference for cat management between cat-owners and non-owners. Cat-owners show a
1119 lower acceptance of lethal options and a higher acceptance toward Trap, Neuter and Return
1120 (TNR) than non-owners. It is interesting that the non-owners had a more negative attitude
1121 toward TNR than did the cat-owners. Since the non-owners do not accept outdoor cats
1122 inhabiting in Town and Rural areas, they do not prefer the option of returning the cats to their
1123 habitats.

1124 The findings highlight a challenge: the outdoor cat management in Town and Rural
1125 on Amami Oshima Island has been conducted to address the degradation of sanitary
1126 environment caused by outdoor cats. However, the current management strategies can be
1127 potential to cause the conflicts. The non-owners have a more negative attitude toward TNR
1128 than do the cat-owners; on the other hand, cat-owners prefer that the outdoor cats remain on
1129 the island. It is necessary to manage both these gaps between the preferences for management
1130 and the current policies and between cat-owners and non-owners' preferences for TNR. The
1131 present study indicates that although the general public wants managers, such as the MoE and
1132 local government in Amami Oshima Island case, to address the outdoor cat issues closing to
1133 human life, the management methods of the issues also have potential conflicts on the
1134 Amami Oshima Island.

1135 *5.1.3 How much are tourists willing to financially support the current outdoor cat*
1136 *management strategy of using a non-lethal option on the island?*

1137 I evaluated tourists' willingness to support outdoor cat management on Amami Oshima
1138 Island. More than 80% of tourists intended to donate funds to non-lethal outdoor cat
1139 management, and the mean willingness to donate was about USD \$14 (1374.1 JPY).

1140 Considering that more than 300,000 tourists visited Amami Oshima Island in 2016
1141 (Kagoshima Prefecture, 2020), results suggest that over 260,000 people may be willing to
1142 donate funds to outdoor cat management that uses the adoption approach, and approximately
1143 358 million JPY (about USD \$3.58 million) could be collected from their monetary
1144 donations. Moreover, the number of visitors will continue to increase in the future, although
1145 the recent COVID-19 pandemic might significantly change the tourism industry. Based on
1146 the current management costs of about USD \$460,000, the research suggests that monetary
1147 donations by tourists may be sufficient to support the non-lethal outdoor cat management
1148 program. Utilizing tourist financial support may have a significant positive effect on outdoor
1149 cat management.

1150 This dissertation also investigated factors affecting the intention to donate to outdoor
1151 cat management using a non-lethal option. Results showed that attitudes toward lethal options
1152 are a significant predictor of the intent to donate. One interesting finding is that respondents
1153 who consider farmland (*Env-Farmland*), rather than forest, as a critical environment on
1154 Amami Oshima Island had a higher intention to donate. The results might also be related to
1155 knowledge gaps regarding the impacts of cats living in farmlands, including the occurrence
1156 of infections transmitted by cats, such as toxoplasmosis (Glen et al., 2019; Nutter et al., 2004;
1157 Tenter, 2009). It is constant with the preferences for outdoor cat management goal, i.e.,
1158 people tend to prefer to the prevention of zoonotic disease, in chapter 4.

1159 There may be a paradoxical problem in tourist support for outdoor cat management,
1160 as the experience of outdoor cat viewing in Amami Oshima Island is a key predictor of the
1161 willingness to donate. The frequency of encounters with outdoor cats in/around farmland can
1162 affect the results. This finding implies that tourists could have a lower intention to donate to
1163 outdoor cat management when the number of cats decreases due to outdoor cat management.
1164 Thus, more aggressive outdoor cat management may lead to lower monetary support from

1165 tourists. Future research should directly assess tradeoffs in tourist desire to watch outdoor
1166 cats versus their desire to see rare species.

1167 5.1.4 *Which goals, among biodiversity conservation, maintenance of a sanitary environment,*
1168 *prevention of zoonotic disease, and cat welfare, do citizens prioritize with respect to*
1169 *outdoor cat management?*

1170 I investigated Japanese citizens' preferences for outdoor cat management goals using the
1171 BWS technique. As a result, our study demonstrates that citizens tend to prefer sanitary
1172 environment maintenance and zoonotic disease prevention over biodiversity conservation and
1173 cat welfare preservation as goals of outdoor cat management. The findings suggest that
1174 outdoor cat management for sanitary environment improvement and zoonotic disease
1175 prevention can get more public support than biodiversity conservation. Although the results
1176 depend on not local island residents' but general citizens' preferences, this finding should
1177 provide useful insights for planning for outdoor cat management with maximizing public
1178 supports in Town and Rural areas on the Amami Oshima Island. Thus, local governments and
1179 MoE should implement outdoor cat management by highlighting the contexts associated with
1180 not biodiversity but human and society, i.e., sanitary environment improvement and zoonotic
1181 diseases prevention. The different preferences of residents for outdoor cats can cause
1182 conflicts about outdoor cat management. Some residents, particularly non-owners, do not
1183 accept outdoor cat inhabiting in Town and Rural areas; on the other hand, other residents who
1184 feel comfortable with outdoor cats tend to want outdoor cats to inhabit spaces in their
1185 neighborhood. Given that the outdoor cat ecology heavily depends on the human behavior
1186 relating to outdoor cats, such as feeding (e.g., Shionosaki et al., 2016), conservation conflicts
1187 and a lack of residents' supports are a barrier to effective management. It is hard to accept
1188 biodiversity conservation goals, but the implementation of outdoor cat management for the
1189 maintenance of sanitary environment goals can be relatively easy to accept. The findings can

1190 apply to other places where there are potentially conservation conflicts relating to outdoor cat
1191 management such as Teuri Island. On Teuri Island, for instance, although outdoor cats have
1192 currently been managed by using Adoption and the number of cats has been decreasing, some
1193 residents, especially fisherman, criticized the cat management and there were conflicts
1194 between some residents and the MoE (Unpublished data: interview survey by the author to
1195 residents on Teuri Island from June 22 to 23, 2016).

1196 Findings also provide novel insights to help prioritize management decisions.
1197 environmental managers, e.g., local government officers in urban areas and MoE rangers in
1198 biodiversity rich areas, should begin to implement cat management to maintain sanitary
1199 environments and prevent zoonotic diseases. Concurrently with the management, the
1200 managers should communicate with residents, i.e., information provision and education, to
1201 obtain citizen support and win an understanding of broader social and natural resources
1202 management goals, including biodiversity conservation. Citizens' support toward outdoor cat
1203 management can decline when cats' negative impacts on the sanitary environment are much
1204 lower. In cases of invasive mammals causing damage to such a primary industry,
1205 management is implemented only after the occurrence of damage, such as that affecting crops
1206 (Ikeda et al., 2004), and invoking control is difficult when the damage is low. That is because
1207 farmers become to be unconcerned with the damage when the damage is lower than their
1208 unacceptable level. In such cases, management acts only when the damage reaches a certain
1209 unacceptable level, with the purpose to prevent agricultural damage (Suzuki & Ikeda, 2019).
1210 It is, therefore, suitable for management goals toward broader social and natural resources
1211 management, including biodiversity conservation while also addressing cats' welfare by
1212 using communications, especially in the biodiversity-rich areas (Mameno et al., 2020; Mitsui
1213 et al., 2018).

1214 This dissertation also contributes to the development of a methodology for
1215 investigating social dimensions of invasion science. By using the BWS technique, I clearly
1216 identified citizens' different preferences for each management goal. This dissertation
1217 indicates that the application of the BWS technique provides useful insights to invasive
1218 species management. The technique enables us to uncover citizens' preferences regarding cat
1219 management while considering the trade-offs associated with each goal. As a result, this
1220 dissertation demonstrates clear differences between the alternatives close to human life and
1221 others.

1222 5.1.5 *Does the provision of information affect citizens' social preferences and their*
1223 *prioritization of outdoor cat management goals?*

1224 The provision of information did not cause citizens to reevaluate their rankings of cat
1225 management goals; however, the provision of ecological information did significantly impact
1226 respondents' preferences. A total of 26% of respondents who received ecological information
1227 evaluated biodiversity conservation as the most appropriate goal; this percentage was higher
1228 than that of control group respondents, in which only 20% of respondents considered
1229 biodiversity conservation as the most important goal. The results are consistent with previous
1230 studies that show that the provision of ecological information had a positive impact on
1231 respondents' preferences regarding invasive species management, which influenced them to
1232 support biodiversity conservation (Mameno et al., 2020; Marzano et al., 2015). Ecological
1233 information provision has another interesting effect: even though it is not statistically
1234 significant, the evaluation of preservation of cat welfare as an outdoor cat management goal
1235 is dropped³ when respondents receive the ecological information.

³ In BWS technique, the results of coefficients of each variable are not independent, i.e., the evaluation of preservation of cat welfare is lower when the other goals are more evaluated. Therefore, we can not completely determine the reason why the evaluation of the preservation of cat welfare is dropped.

On the other hand, the provision of information about the inherent risks of outdoor cats has little effect on respondents' preferences. The results are in contrast to previous suggestions that information about cats' risks outdoors can change people's, especially cat owners', behavior and/or attitude concerning cat management (MacDonald et al., 2015; Shannon et al., 2019). There are several possible explanations for this result, one being the unique culture in Japan; Hall et al. (2016) showed that cat owners who keep their cats indoors consider this as good manners. Furthermore, Japanese people often enjoy directly interacting with cats inside cat cafes, thus in indoor spaces (Hall et al., 2016).

In conclusion, although previous studies concerning biodiversity conservation suggest that each information is a useful tool encouraging public awareness of conservation (MacDonald et al., 2015; Mameno et al., 2020; Shannon et al., 2019; Vane & Runhaar, 2016), our study suggests that information combined with several dimension is the most powerful tools for effective outdoor cat management (Glen & Hoshino, 2020; MacDonald et al., 2015). That is because, despite not significant effects, animal welfare is an important dimension of the outdoor cat problem and their managements.

5.1.6 General discussion

On biodiversity-rich islands, such as Amami Oshima Island, biodiversity conservation through outdoor cat management is an urgent challenge. On Amami Oshima Island, one possible outdoor cat management option, which avoids conservation conflicts, is the implementation of adoption in biodiversity-rich areas, such as forest areas; however, this management method is costly. As shown in Chapter 3, by using the support of tourists who value the unique and rare environment on Amami Oshima Island to partially alleviate the cost burden, it would be possible for the MoE to implement an adoption management plan and promote biodiversity conservation over a long time frame.

Results also suggest the necessity of zoning management. Outdoor cats living in forests should preferentially be eradicated using adoption, even if it involves high-cost methods; however, eradicating the threat of outdoor cats to native ecosystems in forests will be difficult using adoption alone. On Amami Oshima Island, outdoor cats are supplied to forests from towns and rural areas, where there are potential conservation conflicts concerning outdoor cat management. Social preferences for invasive species management depend on the context, and citizens are highly interested in improving public health through outdoor cat management. This implies that the local government, e.g., Amami City, must begin to address outdoor cat management from the perspective of public health preservation in order to improve public support with minimal conflicts.

In addition, although the only current viable management strategy is adoption, to achieve a state in which invaders have no impact on biodiversity hotspots, there is a need to develop new strategies, such as the implementation of TNR, via negotiations between local residents and conservation groups. The findings of Chapter 4 demonstrate that the provision of ecological information is a useful tool for building consensus. Moreover, given that animal welfare is an important dimension of the outdoor cat problem and their management, information about the inherent risks to outdoor cats may be valuable tools for negotiation, despite not having a significant effect on public preferences.

5.2 Implications

Limited financial and human resources requires that invasive species management plans prioritize strategies and goals with consideration for citizens' preferences. Citizen support for invasive species management plays an essential role in management success (Dunn et al., 2018; Gaertner et al., 2016; Lewis et al., 2019; McNeely, 2001b). The findings of this dissertation provide useful information for outdoor cat management on Amami Oshima Island, where biodiversity conservation must be implemented. The biodiversity conservation

goal of outdoor cat management was also supported by residents of Amami Oshima Island, which implies that zoning management, i.e., preferential outdoor cat eradication from biodiversity-rich areas, will play a pivotal role in outdoor cat management in Japan. Since attitudes toward outdoor cats differed between forest and other areas, residents would agree with the implementation of zoning management and the elimination of outdoor cats from forests; however, lethal cat management was not considered acceptable by residents. This criticism leads to conservation conflicts among residents, which is a driver that delays the implementation of conservation strategies. Chapter 5 illustrates that tourist donations have the potential to enhance the implementation of outdoor cat management programs while helping to minimize conservation conflicts (Loyd & Miller, 2010a, 2010b; Wald & Jacobson, 2013).

On the other hand, the outdoor cat management in Town and Rural area on Amami Oshima Island is controversial. People who feel uncomfortable with outdoor cats desire the management, on the other hand, people who feel comfortable with outdoor cats do not desire the management. The findings indicate that. Social preferences for invasive species management significantly depend on the contexts, and citizens are highly interested in public health improvement through outdoor cat management. it implies that the local government, e.g., Amami City, needs to begin to address the outdoor cat management from public health preservation in order to get public supports with minimizing conflicts.

Findings suggest the importance of prioritizing the outdoor cat management strategy. Given that conservation conflicts are a barrier to effective management, it is hard to accept biodiversity conservation goals. On the other hand, managers, such as MoE and local government in Amami Oshima Island case, can implement maintenance of sanitary environment goals with relative ease. However, it is also necessary to gradually shift management goals toward broader social and natural resources management, including

biodiversity conservation while also addressing cats' welfare by using communications such as ecological information. The environmental managers should start from implementation of outdoor cat management to maintain sanitary environments and prevent zoonotic diseases. At the same time, managers should communicate with residents, i.e., information provision and education, to obtain citizen support and win an understanding of broader social and natural resources management goals, including biodiversity conservation. That is because, as in the case of agricultural damage, citizens' support toward cat management can decline when cats' negative impacts on the sanitary environment are much lower. People often only address the issues when the issues are more serious than their unacceptable level, such as invasive mammals causing damage to the primary industry (Ikeda et al., 2014). In such cases, the more management progress, the fewer management supports are gotten (Suzuki & Ikeda, 2019). Therefore, the purpose of management and/or information provision should be changed in order to get more public supports and awareness. As Mitsui suggested, adjusting policies with information provisions can play an important role in the enhancement of invasive species management because public attitudes toward invasive species heavily depend on the contexts.

5.3 Conclusions

To date, invasive species have become a major environmental problem, requiring efficient management (Doherty et al., 2016; Paini et al., 2016; Saavedra & Medina, 2020). Specifically, because they are charismatic companion animals, non-native cats have been introduced around the world (Jarić et al., 2020) and, as a result, contribute to environmental degradation. This dissertation uncovered social preferences for invasive species management in the form of outdoor cat management on biodiversity hotspot islands in Japan, using Amami Oshima Island as a case. As a result, this dissertation contributes to the feasible, effective management of outdoor cats with minimal conflicts on biodiversity-rich islands in

1335 Asia. Because they are companion animals, i.e., their population are large, outdoor cats must
1336 be managed using a long-term strategy; however, conservation budgets tend to be limited
1337 (Anand, 2004; James, Gaston, & Balmford, 1999). Therefore, there is a need to implement
1338 effective management programs with citizen support under a limited environmental
1339 management budget. On Amami Oshima Island, particularly because it is expected to be
1340 designated as a natural World Heritage site, outdoor cat management is an urgent challenge.
1341 Considering that the integration of social preferences into policymaking minimizes conflicts
1342 (Novoa et al., 2018; Shackleton, Adriaens, et al., 2019), my findings may help to implement
1343 effective outdoor cat management programs under a limited budget. The present study also
1344 provides useful insights for the development of policy and management strategies relating to
1345 outdoor cats on the island, based on citizens' preferences for outdoor cat management.
1346 Finally, the findings also highlight the importance of strategic invasive species management
1347 strategies that minimize conflicts (Dunn et al., 2018; Lewis et al., 2019). The contributions of
1348 this dissertation enhance the area of efficient invasive species management with limited
1349 budgets and human resources.
1350

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1362

References

- Amami Oshima Island., 2015. Biodiversity regional strategy in Amami Oshima Island (in Japanese), Retrieved 25 November 2016 from <https://www.city.amami.lg.jp/kankyo/machi/shizen/documents/zentai300.pdf>
- Ajzen, L., & Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Prentice Hall.
- Anand, P. B. (2004). Financing the Provision of Global Public Goods. *The World Economy*, 27(2), 215-237. doi:10.1111/j.1467-9701.2004.00597.x
- Arrow, K., Solow, R., Portney, P. R., Leamer, E. E., Radner, R., & Schuman, H. (1993). Report of the NOAA panel on contingent valuation. *Federal register*, 58(10), 4601-4614.
- Barrows, P. L. (2004). Professional, ethical, and legal dilemmas of trap-neuter-release. *Journal of the American Veterinary Medical Association*, 225, 1365-1369. doi:10.2460/javma.2004.225.1365
- Beckerman, A. P., Boots, M., & Gaston, K. J. (2007). Urban bird declines and the fear of cats. *Animal Conservation*, 10(3), 320-325. doi:10.1111/j.1469-1795.2007.00115.x
- Blaine, T. W., Lichtkoppler, F. R., Jones, K. R., & Zondag, R. H. (2005). An assessment of household willingness to pay for curbside recycling: A comparison of payment card and referendum approaches. *Journal of Environmental Management*, 76(1), 15-22. doi:<https://doi.org/10.1016/j.jenvman.2005.01.004>
- Bonnaud, E., Medina, F. M., Vidal, E., Nogales, M., Tershy, B., Zavaleta, E., . . . Horwath, S. V. (2011). The diet of feral cats on islands: a review and a call for more studies. *Biological Invasions*, 13(3), 581-603. doi:10.1007/s10530-010-9851-3

1386 Brander, L. M., & Koetse, M. J. (2011). The value of urban open space: Meta-analyses of
 1387 contingent valuation and hedonic pricing results. *Journal of Environmental*
 1388 *Management*, 92(10), 2763-2773. doi:<https://doi.org/10.1016/j.jenvman.2011.06.019>

1389 Bremner, A., & Park, K. (2007). Public attitudes to the management of invasive non-native
 1390 species in Scotland. *Biological Conservation*, 139(3-4), 306-314.
 1391 doi:10.1016/j.biocon.2007.07.005

1392 Brickel, C. (1979). The therapeutic roles of cat mascots with a hospital based geriatric
 1393 population: a staff survey. *The Gerontologist*, 19, 368-372.

1394 Calver, M., Thomas, S., Bradley, S., & McCutcheon, H. (2007). Reducing the rate of
 1395 predation on wildlife by pet cats: The efficacy and practicability of collar-mounted
 1396 pounce protectors. *Biological Conservation*, 137(3), 341-348.
 1397 doi:10.1016/j.biocon.2007.02.015

1398 Campbell, K., Harper, G., Algar, D., Hanson, C. C., Keitt, B. S., & Robinson, S. (2011).
 1399 Review of feral cat eradications on islands. *Island Invasives: Eradication and*
 1400 *Management*. (Eds CR Veitch, MN Clout and DR Towns.) pp, 37-46.

1401 Champ, P. A., & Bishop, R. C. (2001). Donation Payment Mechanisms and Contingent
 1402 Valuation: An Empirical Study of Hypothetical Bias. *Environmental and Resource*
 1403 *Economics*, 19(4), 383-402. doi:10.1023/A:1011604818385

1404 Chao, R. F., & Lin, T. E. (2017). Effect of citizen action on suppression of invasive alien
 1405 lizard population: a case of the removal of *Eutropis multifasciata* on Green Island,
 1406 Taiwan. source: *Applied Ecology and Environmental Research*, 15, 1-13.

1407 Chase, L. C., Schusler, T. M., & Decker, D. J. (2000). Innovations in Stakeholder
 1408 Involvement: What's the Next Step? *Wildlife Society Bulletin (1973-2006)*, 28(1),
 1409 208-217.

1410 Ciriacy-Wantrup, S. V. (1947). Capital Returns from Soil-Conservation Practices. *Journal of*
1411 *Farm Economics*, 29(4), 1181-1196. doi:10.2307/1232747

1412 Clout, M. N., & Williams, P. A. (2009). *Invasive species management: a handbook of*
1413 *principles and techniques*: Oxford University Press.

1414 Convention on Biological Diversity (CBD) (2008) *Alien Species that Threaten Ecosystems,*
1415 *Habitats or Species [Article 8(h)]*, United Nations

1416 Crowley, S. L., Hinchliffe, S., & McDonald, R. A. (2017). Conflict in invasive species
1417 management. *Frontiers in Ecology and the Environment*, 15(3), 133-141.
1418 doi:10.1002/fee.1471

1419 Dabritz, H. a., Atwill, E. R., Gardner, I. a., Miller, M. a., & Conrad, P. a. (2006). Outdoor
1420 fecal deposition by free-roaming cats and attitudes of cat owners and nonowners
1421 toward stray pets, wildlife, and water pollution. *Journal of the American Veterinary*
1422 *Medical Association*, 229(1), 74-81. doi:10.2460/javma.229.1.74

1423 Davis, R. K. (1963). *The value of outdoor recreation: an economic study of Maine woods.*
1424 *Unpublished Ph. D. dissertation, Harvard University.*

1425 Decker, D. J., Krueger, C. C., Baer, R. A., Knuth, B. A., & Richmond, M. E. (1996). From
1426 clients to stakeholders: A philosophical shift for fish and wildlife management.
1427 *Human Dimensions of Wildlife*, 1(1), 70-82. doi:10.1080/10871209609359053

1428 Devine-Wright, P. (2009). Rethinking NIMBYism: The role of place attachment and place
1429 identity in explaining place-protective action. *Journal of Community & Applied*
1430 *Social Psychology*, 19(6), 426-441. doi:10.1002/casp.1004

1431 Doubutukikin, 2020. Fiscal Year Annual Report. Retrieved 12 Dec, 2020 from
1432 <https://www.doubutukikin.or.jp/activity/campaign/campaign-latest/>

1433 Dunn, M., Marzano, M., Forster, J., & Gill, R. M. A. (2018). Public attitudes towards “pest”
 1434 management: Perceptions on squirrel management strategies in the UK. *Biological*
 1435 *Conservation*, 222, 52-63.

1436 Ecological Society of Japan, (2003). Handbook of Alien invasive species in Japan.

1437 Ericsson, G., Bostedt, G., & Kindberg, J. (2008). Wolves as a Symbol of People's
 1438 Willingness to Pay for Large Carnivore Conservation. *Society & Natural Resources*,
 1439 21(4), 294-309. doi:10.1080/08941920701861266

1440 Finn, A., & Louviere, J. J. (1992). Determining the Appropriate Response to Evidence of
 1441 Public Concern: The Case of Food Safety. *Journal of Public Policy & Marketing*,
 1442 11(2), 12-25. doi:10.1177/074391569201100202

1443 Ford-Thompson, A. E. S., Snell, C., Saunders, G., & White, P. C. L. (2012). Stakeholder
 1444 Participation in Management of Invasive Vertebrates. *Conservation Biology*, 26(2),
 1445 345-356. doi:https://doi.org/10.1111/j.1523-1739.2011.01819.x

1446 Gaertner, M., Larson, B. M. H., Irlich, U. M., Holmes, P. M., Stafford, L., van Wilgen, B.
 1447 W., & Richardson, D. M. (2016). Managing invasive species in cities: A framework
 1448 from Cape Town, South Africa. *Landscape and Urban Planning*, 151, 1-9.

1449 García-Llorente, M., Martín-López, B., Nunes, P. A. L. D., González, J. A., Alcorlo, P., &
 1450 Montes, C. (2011). Analyzing the Social Factors That Influence Willingness to Pay
 1451 for Invasive Alien Species Management Under Two Different Strategies: Eradication
 1452 and Prevention. *Environmental Management*, 48(3), 418-435. doi:10.1007/s00267-
 1453 011-9646-z

1454 Gardener, M. R., Atkinson, R., & Rentería, J. L. (2010). Eradications and people: lessons
 1455 from the plant eradication program in Galapagos. *Restoration Ecology*, 18(1), 20-29.

1456 Geffroy, B., Samia, D. S. M., Bessa, E., & Blumstein, D. T. (2015). How Nature-Based
 1457 Tourism Might Increase Prey Vulnerability to Predators. *Trends in Ecology &*
 1458 *Evolution*, 30(12), 755-765. doi:<https://doi.org/10.1016/j.tree.2015.09.010>

1459 Genovesi, P., & Bertolino, S. (2001). Human dimension aspects in invasive alien species
 1460 issues: the case of the failure of the grey squirrel eradication project in Italy. *The great*
 1461 *reshuffling: human dimensions of invasive alien species*, 242.

1462 Glen, A. S., & Hoshino, K. (2020). Social and logistical challenges in managing invasive
 1463 predators: insights from islands in Japan and New Zealand. *Pacific Conservation*
 1464 *Biology*.

1465 Glen, A. S., Perry, M., Yockney, I., Cave, S., Gormley, A. M., Leckie, C., . . . Norbury, G. L.
 1466 (2019). Predator control on farmland for biodiversity conservation: a case study from
 1467 Hawke's Bay, New Zealand. *New Zealand Journal of Ecology*, 43(1), 1-7.

1468 Greiner, R. (2015). Motivations and attitudes influence farmers' willingness to participate in
 1469 biodiversity conservation contracts. *Agricultural Systems*, 137, 154-165.
 1470 doi:<https://doi.org/10.1016/j.agsy.2015.04.005>

1471 Hall, C. M., Adams, N. A., Bradley, J. S., Bryant, K. A., Davis, A. A., Dickman, C. R., . . .
 1472 Calver, M. C. (2016). Community Attitudes and Practices of Urban Residents
 1473 Regarding Predation by Pet Cats on Wildlife: An International Comparison. *Plos One*,
 1474 11(4), e0151962-e0151962. doi:10.1371/journal.pone.0151962

1475 Hanemann, M., Loomis, J., & Kanninen, B. (1991). Statistical Efficiency of Double-Bounded
 1476 Dichotomous Choice Contingent Valuation. *American Journal of Agricultural*
 1477 *Economics*, 73(4), 1255-1263. doi:10.2307/1242453

1478 Hanley, N., & Czajkowski, M. (2019). The Role of Stated Preference Valuation Methods in
 1479 Understanding Choices and Informing Policy. *Review of Environmental Economics*
 1480 *and Policy*, 13(2), 248-266. doi:10.1093/reep/rez005

1481 Harrison, G. W., & List, J. A. (2004). Field Experiments. *Journal of Economic Literature*,
 1482 42(4), 1009-1055. doi:10.1257/0022051043004577
 1483 Harrison, G. W., & Rutström, E. E. (2008). Chapter 81 Experimental Evidence on the
 1484 Existence of Hypothetical Bias in Value Elicitation Methods. In C. R. Plott & V. L.
 1485 Smith (Eds.), *Handbook of Experimental Economics Results* (Vol. 1, pp. 752-767):
 1486 Elsevier.
 1487 Hernández, B., Carmen Hidalgo, M., Salazar-Laplace, M. E., & Hess, S. (2007). Place
 1488 attachment and place identity in natives and non-natives. *Journal of Environmental*
 1489 *Psychology*, 27(4), 310-319. doi:https://doi.org/10.1016/j.jenvp.2007.06.003
 1490 Hobbs, R. J. (2000). *Invasive species in a changing world*: Island Press.
 1491 Ikeda, T., Asano, M., Matoba, Y., & Abe, G. (2004). Present status of invasive alien raccoon
 1492 and its impact in Japan. *Global environmental research*, 8(2), 125-131.
 1493 IPBES. (2019): Global assessment report on biodiversity and ecosystem services of the
 1494 Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.
 1495 E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn,
 1496 Germany.
 1497 IUCN. (2018). *World Heritage evaluations 2018: IUCN evaluations of nominations of natural*
 1498 *and mixed properties to the World Heritage List*.
 1499 Iverson, J. B. (1978). The impact of feral cats and dogs on populations of the West Indian
 1500 rock iguana, *Cyclura carinata*. *Biological Conservation*, 14(1), 63-73.
 1501 doi:10.1016/0006-3207(78)90006-X
 1502 James, A. N., Gaston, K. J., & Balmford, A. (1999). Balancing the Earth's accounts. *Nature*,
 1503 401(6751), 323-324. doi:10.1038/43774

1504 Jarić, I., Courchamp, F., Correia, R. A., Crowley, S. L., Essl, F., Fischer, A., . . . Jeschke, J.
 1505 M. (2020). The role of species charisma in biological invasions. *Frontiers in Ecology*
 1506 *and the Environment*, n/a(n/a). doi:10.1002/fee.2195
 1507 Jehl, J., & Parkes, K. (1983). "Replacements" of Landbird Species on Socorro Island,
 1508 Mexico. *Auk*, 100(3), 551-559. doi:10.1016/0025-326X(83)90206-0
 1509 Kagoshima Prefecture. (2020). Trends in Amami Islands tourism 2018 (In Japanese).
 1510 [http://www.pref.kagoshima.jp/aq01/chiiki/oshima/chiiki/zeniki/oshirase/documents/3](http://www.pref.kagoshima.jp/aq01/chiiki/oshima/chiiki/zeniki/oshirase/documents/38010_20200305144423-1.pdf)
 1511 [8010_20200305144423-1.pdf](http://www.pref.kagoshima.jp/aq01/chiiki/oshima/chiiki/zeniki/oshirase/documents/38010_20200305144423-1.pdf).
 1512 Kishino, T., & Yonezawa, T. (2013). Seasonal distribution of Ryukyu-ayu *Plecoglossus*
 1513 *altivelis ryukyuensis* in the Katoku River, Amami-oshima Island, southern Japan. *Jpn*
 1514 *J Ichthyol*, 60, 91-101.
 1515 Kubo, T., Mieno, T., & Kuriyama, K. (2019). Wildlife viewing: The impact of money-back
 1516 guarantees. *Tourism Management*, 70, 49-55.
 1517 Kubo, T., & Shoji, Y. (2014). Spatial tradeoffs between residents' preferences for brown bear
 1518 conservation and the mitigation of human–bear conflicts. *Biological Conservation*,
 1519 176, 126-132. doi:<https://doi.org/10.1016/j.biocon.2014.05.019>
 1520 Kubo, T., Shoji, Y., Tsuge, T., & Kuriyama, K. (2018). Voluntary Contributions to Hiking
 1521 Trail Maintenance: Evidence From a Field Experiment in a National Park, Japan.
 1522 *Ecological Economics*, 144, 124-128.
 1523 doi:<https://doi.org/10.1016/j.ecolecon.2017.07.032>
 1524 Kubo, T., Tsuge, T., Abe, H., & Yamano, H. (2018). Understanding island residents' anxiety
 1525 about impacts caused by climate change using Best–Worst Scaling: a case study of
 1526 Amami islands, Japan. *Sustainability Science*, 1-8.

1527 Larson, C. L., Reed, S. E., Merenlender, A. M., & Crooks, K. R. (2016). Effects of
 1528 Recreation on Animals Revealed as Widespread through a Global Systematic Review.
 1529 PLOS ONE, 11(12), e0167259. doi:10.1371/journal.pone.0167259
 1530 Latham, A. D. M., Warburton, B., Byrom, A. E., & Pech, R. P. (2017). The ecology and
 1531 management of mammal invasions in forests. *Biological Invasions*, 19(11), 3121-
 1532 3139. doi:10.1007/s10530-017-1421-5
 1533 Lepczyk, C. A., Mertig, A. G., & Liu, J. (2004). Landowners and cat predation across rural-
 1534 to-urban landscapes. *Biological Conservation*, 115(2), 191-201. doi:10.1016/S0006-
 1535 3207(03)00107-1
 1536 Levy, J. K., & Crawford, P. C. (2004). Humane strategies for controlling feral cat
 1537 populations. *Journal of the American Veterinary Medical Association*, 225(9), 1354-
 1538 1360. doi:10.2460/javma.2004.225.1354
 1539 Levy, J. K., Woods, J. E., Turick, S. L., & Etheridge, D. L. (2003). Number of unowned free-
 1540 roaming cats in a college community in the southern United States and characteristics
 1541 of community residents who feed them. *Journal of the American Veterinary Medical*
 1542 *Association*, 223(2), 202-205. doi:10.2460/javma.2003.223.202
 1543 Lewis, C. L., Granek, E. F., & Nielsen-Pincus, M. (2019). Assessing local attitudes and
 1544 perceptions of non-native species to inform management of novel ecosystems.
 1545 *Biological Invasions*, 21(3), 961-982. doi:10.1007/s10530-018-1875-0
 1546 Linas, B., & Martynas, K. (2012). Acceptance of brown bears in Lithuania, a non-bear
 1547 country. *Ursus*, 23(2), 168-178. doi:10.2192/URSUS-D-12-00016.1
 1548 Lohr, C. A., & Lepczyk, C. A. (2014). Desires and management preferences of stakeholders
 1549 regarding feral cats in the hawaiian Islands. *Conservation Biology*, 28(2), 392-403.
 1550 doi:10.1111/cobi.12201

- 1551 Loomis, J., Haefele, M., Dubovsky, J., Lien, A. M., Thogmartin, W. E., Diffendorfer, J., . . .
 1552 Merideth, R. (2018). Do economic values and expenditures for viewing waterfowl in
 1553 the U.S. differ among species? *Human Dimensions of Wildlife*, 23(6), 587-596.
 1554 doi:10.1080/10871209.2018.1496371
- 1555 Loomis, J. B., & duVair, P. H. (1993). Evaluating the Effect of Alternative Risk
 1556 Communication Devices on Willingness to Pay: Results from a Dichotomous Choice
 1557 Contingent Valuation Experiment. *Land Economics*, 69(3), 287-298.
 1558 doi:10.2307/3146594
- 1559 Louviere, J., Flynn, T. N., & Marley, A. A. J. (2015). *Best-worst scaling: Theory, methods*
 1560 *and applications*: Cambridge University Press.
- 1561 Louviere, J., Lings, I., Islam, T., Gudergan, S., & Flynn, T. (2013). An introduction to the
 1562 application of (case 1) best–worst scaling in marketing research. *International Journal*
 1563 *of Research in Marketing*, 30(3), 292-303.
 1564 doi:https://doi.org/10.1016/j.ijresmar.2012.10.002
- 1565 Lowe, S., Browne, M., Boudjelas, S., & De Poorter, M. (2000). 100 of the world's worst
 1566 invasive alien species: a selection from the global invasive species database (Vol. 12):
 1567 Invasive Species Specialist Group Auckland.
- 1568 Loyd, K. A., & Miller, C. A. (2010). Factors Related to Preferences for Trap-Neuter–Release
 1569 Management of Feral Cats Among Illinois Homeowners. *The Journal of Wildlife*
 1570 *Management*, 74(1), 160-165. doi:10.2193/2008-488
- 1571 Loyd, K. A. T., & Hernandez, S. M. (2012). Public Perceptions of Domestic Cats and
 1572 Preferences for Feral Cat Management in the Southeastern United States. *Anthrozoös*,
 1573 25(3), 337-351. doi:10.2752/175303712X13403555186299

1574 Loyd, K. A. T., Hernandez, S. M., Carroll, J. P., Abernathy, K. J., & Marshall, G. J. (2013).
1575 Quantifying free-roaming domestic cat predation using animal-borne video cameras.
1576 Biological Conservation, 160, 183-189. doi:10.1016/j.biocon.2013.01.008

1577 Loyd, K. A. T., & Miller, C. a. (2010). Influence of Demographics, Experience and Value
1578 Orientations on Preferences for Lethal Management of Feral Cats. Human
1579 Dimensions of Wildlife, 15(4), 262-273. doi:10.1080/10871209.2010.491846

1580 Lugo, A. E., & Snedaker, S. C. (1974). The ecology of mangroves. Annual review of ecology
1581 and systematics, 5(1), 39-64.

1582 MacDonald, E., Milfont, T., & Gavin, M. (2015). What drives cat-owner behaviour? First
1583 steps towards limiting domestic-cat impacts on native wildlife. Wildlife Research,
1584 42(3), 257-265.

1585 Macmillan, D. C., Smart, T. S., & Thorburn, A. P. (1999). A Field Experiment Involving
1586 Cash and Hypothetical Charitable Donations. Environmental and Resource
1587 Economics, 14(3), 399-412. doi:10.1023/A:1008304405734

1588 Malpica-Cruz, L., Haider, W., Smith, N. S., Fernández-Lozada, S., & Côté, I. M. (2017).
1589 Heterogeneous Attitudes of Tourists toward Lionfish in the Mexican Caribbean:
1590 Implications for Invasive Species Management. Frontiers in Marine Science, 4, 138.

1591 Mameno, K., Kubo, T., Shoji, Y., & Tsuge, T. (2020). How to Engage Tourists in Invasive
1592 Carp Removal: Application of a Discrete Choice Model. In O. Saito, S. M.
1593 Subramanian, S. Hashimoto, & K. Takeuchi (Eds.), Managing Socio-ecological
1594 Production Landscapes and Seascapes for Sustainable Communities in Asia: Mapping
1595 and Navigating Stakeholders, Policy and Action (pp. 31-44). Singapore: Springer
1596 Singapore.

1597 Mameno, K., Kubo, T., & Suzuki, M. (2017). Social challenges of spatial planning for
 1598 outdoor cat management in Amami Oshima Island, Japan. *Global Ecology and*
 1599 *Conservation*, 10, 184-193.

1600 Manfredo, M. J. (2008). Who Cares About Wildlife? In M. J. Manfredo (Ed.), *Who Cares*
 1601 *About Wildlife? Social Science Concepts for Exploring Human-Wildlife*
 1602 *Relationships and Conservation Issues* (pp. 1-27). New York, NY: Springer US.

1603 Martín-López, B., Montes, C., & Benayas, J. (2007). The non-economic motives behind the
 1604 willingness to pay for biodiversity conservation. *Biological Conservation*, 139(1), 67-
 1605 82. doi:<https://doi.org/10.1016/j.biocon.2007.06.005>

1606 McIntosh, C. R., Shogren, J. F., & Finnoff, D. C. (2010). Invasive species and delaying the
 1607 inevitable: Valuation evidence from a national survey. *Ecological Economics*, 69(3),
 1608 632-640.

1609 McNeely, J. A. (2001a). Global strategy on invasive alien species: IUCN.

1610 McNeely, J. A. (2001b). The great reshuffling. Human dimensions of invasive alien species.

1611 Medina, F. M., Bonnaud, E., Vidal, E., Tershy, B. R., Zavaleta, E. S., Josh Donlan, C., . . .
 1612 Nogales, M. (2011). A global review of the impacts of invasive cats on island
 1613 endangered vertebrates. *Global Change Biology*, 17(11), 3503-3510.
 1614 doi:[10.1111/j.1365-2486.2011.02464.x](https://doi.org/10.1111/j.1365-2486.2011.02464.x)

1615 Medina, F. M., & Nogales, M. (1996). A review of the diet of feral domestic cats (*Felis*
 1616 *silvestris f. catus*) on the Canary Islands, with new data from the laurel forest of La
 1617 Gomera.

1618 Mellink, E. (1992). The status of *Neotoma anthonyi* (Rodentia, Muridae, Cricetinae) of
 1619 Todos Santos Islands, Baja California, Mexico. *Bulletin of the Southern California*
 1620 *Academy of Sciences*, 91(3), 137-140.

1621 Melson, G. F. (2003). Child Development and the Human-Companion Animal Bond.
 1622 American Behavioral Scientist, 47(1), 31-39. doi:10.1177/0002764203255210
 1623 Ministry of Environment, (2015). Reports of research in ecosystem management and
 1624 population of feral cats on Amami Oshima Island in 2014.
 1625 Ministry of the Environment. (2019). The budget for the natural World Heritage conservation
 1626 and management of facility facilities (in Japanese). Retrieved 12 May, 2020 from
 1627 <https://www.env.go.jp/guide/budget/r02/r02juten-sesakushu/028.pdf>
 1628 Ministry of the Environment. (2018). Cat management plan for ecosystem conservation in
 1629 Amami Oshima (in Japanese). Retrieved 12 May, 2020 from
 1630 https://www.env.go.jp/nature/kisyo/amami_nonekomp.pdf.
 1631 Mitchell, N., Haeffner, R., Veer, V., Fulford-Gardner, M., Clerveaux, W., Veitch, C. R., &
 1632 Mitchell, G. (2002). Cat eradication and the restoration of endangered iguanas
 1633 (*Cyclura carinata*) on Long Cay, Caicos bank, Turks and Caicos Islands, British West
 1634 Indies. Turning the Tide: The Eradication of Invasive Species (eds Veitch CR, Clout
 1635 MN), 206-212.
 1636 Mitsui, S., Kubo, T., & Yoshida, M. (2018). Analyzing the change in long-term information
 1637 provision on cat management around a world natural heritage site. European Journal
 1638 of Wildlife Research, 64(1), 9. doi:10.1007/s10344-018-1170-5
 1639 Morzillo, A. T., & Needham, M. D. (2015). Landowner Incentives and Normative Tolerances
 1640 for Managing Beaver Impacts. Human Dimensions of Wildlife, 20(6), 514-530.
 1641 doi:10.1080/10871209.2015.1083062
 1642 Murphy, J. J., Allen, P. G., Stevens, T. H., & Weatherhead, D. (2005). A Meta-analysis of
 1643 Hypothetical Bias in Stated Preference Valuation. Environmental and Resource
 1644 Economics, 30(3), 313-325. doi:10.1007/s10640-004-3332-z

1645 Mwebaze, P., MacLeod, A., Tomlinson, D., Barois, H., & Rijpma, J. (2010). Economic
 1646 valuation of the influence of invasive alien species on the economy of the Seychelles
 1647 islands. *Ecological Economics*, 69(12), 2614-2623.
 1648 doi:<https://doi.org/10.1016/j.ecolecon.2010.08.006>

1649 Nimmo, D. G., & Miller, K. K. (2007). Ecological and human dimensions of management of
 1650 feral horses in Australia: a review. *Wildlife Research*, 34(5), 408-417.

1651 Nishida, M. (1988). A new subspecies of the ayu, *Plecoglossus altivelis*, (Plecoglossidae)
 1652 from the Ryukyu Islands. *Japanese Journal of Ichthyology*, 35(3), 236-242.

1653 Nishizawa, E., Kurokawa, T., & Yabe, M. (2006). Policies and resident's willingness to pay
 1654 for restoring the ecosystem damaged by alien fish in Lake Biwa, Japan.
 1655 *environmental science & policy*, 9(5), 448-456.

1656 Nogales, M., Martín, A., Tershy, B. R., Donlan, C. J., Veitch, D., Puerta, N., . . . Alonso, J.
 1657 (2004). A review of feral cat eradication on islands. *Conservation Biology*, 18(2),
 1658 310-319. doi:10.1111/j.1523-1739.2004.00442.x

1659 Novoa, A., Shackleton, R., Canavan, S., Cybèle, C., Davies, S. J., Dehnen-Schmutz, K., . . .
 1660 Wilson, J. R. U. (2018). A framework for engaging stakeholders on the management
 1661 of alien species. *Journal of Environmental Management*, 205, 286-297.
 1662 doi:<https://doi.org/10.1016/j.jenvman.2017.09.059>

1663 Nunes, P. A. L. D., & Van Den Bergh, J. C. (2004). Can people value protection against
 1664 invasive marine species? Evidence from a joint TC–CV survey in the Netherlands.
 1665 *Environmental and Resource Economics*, 28(4), 517-532.

1666 Nutter, F. B., Dubey, J. P., Levine, J. F., Breitschwerdt, E. B., Ford, R. B., & Stoskopf, M. K.
 1667 (2004). Seroprevalences of antibodies against *Bartonella henselae* and *Toxoplasma*
 1668 *gondii* and fecal shedding of *Cryptosporidium* spp, *Giardia* spp, and *Toxocara cati* in

1669 feral and pet domestic cats. *Journal of the American Veterinary Medical Association*,
 1670 225(9), 1394-1398. doi:10.2460/javma.2004.225.1394
 1671 O'Haire, M. (2010). Companion animals and human health: Benefits, challenges, and the
 1672 road ahead. *Journal of Veterinary Behavior: Clinical Applications and Research*, 5(5),
 1673 226-234. doi:10.1016/j.jveb.2010.02.002
 1674 O'Haire, M. E. (2013). Animal-assisted intervention for autism spectrum disorder: A
 1675 systematic literature review. *Journal of Autism and Developmental Disorders*, 43(7),
 1676 1606-1622. doi:10.1007/s10803-012-1707-5
 1677 Pejchar, L., & Mooney, H. A. (2009). Invasive species, ecosystem services and human well-
 1678 being. *Trends in Ecology and Evolution*, 24(9), 497-504.
 1679 doi:10.1016/j.tree.2009.03.016
 1680 Perry, D. A. N., & Perry, G. A. D. (2008). Improving Interactions between Animal Rights
 1681 Groups and Conservation Biologists. *Conservation Biology*, 22(1), 27-35.
 1682 doi:https://doi.org/10.1111/j.1523-1739.2007.00845.x
 1683 Peterson, M. N., Hartis, B., Rodriguez, S., Green, M., & Lepczyk, C. A. (2012). Opinions
 1684 from the Front Lines of Cat Colony Management Conflict. *PLoS ONE*, 7(9).
 1685 doi:10.1371/journal.pone.0044616
 1686 Polidoro, B. A., Carpenter, K. E., Collins, L., Duke, N. C., Ellison, A. M., Ellison, J. C., . . .
 1687 Koedam, N. E. (2010). The loss of species: mangrove extinction risk and geographic
 1688 areas of global concern. *PLoS One*, 5(4), e10095. doi:10.1371/journal.pone.0010095
 1689 R Core Team, 2016. R: A language and environment for statistical computing. R Foundation
 1690 for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.
 1691 R Core Team. (2019). R: A language and environment for statistical computing. R
 1692 Foundation for Statistical Computing. <https://www.R-project.org/>

1693 Raghavarao, D., & Padgett, L. V. (2005). Block designs: analysis, combinatorics, and
1694 applications (Vol. 17): World Scientific.

1695 Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., . . . Stringer, L.
1696 C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural
1697 resource management. *Journal of Environmental Management*, 90(5), 1933-1949.
1698 doi:<https://doi.org/10.1016/j.jenvman.2009.01.001>

1699 Rogala, J. K., Hebblewhite, M., Whittington, J., White, C. A., Coleshill, J., & Musiani, M.
1700 (2011). Human Activity Differentially Redistributes Large Mammals in the Canadian
1701 Rockies National Parks. *Ecology and Society*, 16(3).

1702 Ryan, M., Scott, D. A., & Donaldson, C. (2004). Valuing health care using willingness to
1703 pay: a comparison of the payment card and dichotomous choice methods. *Journal of*
1704 *Health Economics*, 23(2), 237-258. doi:<https://doi.org/10.1016/j.jhealeco.2003.09.003>

1705 Shackleton, R. T., Adriaens, T., Brundu, G., Dehnen-Schmutz, K., Estévez, R. A., Fried,
1706 J., . . . Richardson, D. M. (2019). Stakeholder engagement in the study and
1707 management of invasive alien species. *Journal of Environmental Management*, 229,
1708 88-101. doi:<https://doi.org/10.1016/j.jenvman.2018.04.044>

1709 Shackleton, R. T., Richardson, D. M., Shackleton, C. M., Bennett, B., Crowley, S. L.,
1710 Dehnen-Schmutz, K., . . . Larson, B. M. H. (2019). Explaining people's perceptions of
1711 invasive alien species: A conceptual framework. *Journal of Environmental*
1712 *Management*, 229, 10-26. doi:<https://doi.org/10.1016/j.jenvman.2018.04.045>

1713 Shionosaki, K., Yamada, F., Ishikawa, T., & Shibata, S. (2015). Feral cat diet and predation
1714 on endangered endemic mammals on a biodiversity hot spot (Amami–Ohshima
1715 Island, Japan). *Wildlife Research*, 42(4), 343-352.

1716 Shionosaki, K., Shigeki S., Yamada, F., Shibata, S. (2016). Changes in free-roaming cat
1717 activity following a regulation prohibiting feeding: A case study at a mountain forest

1718 near residential area in Amami City on Amami-Oshima Island, Japan. *Wildlife and*
 1719 *Human Society* 3(2), 1–13.

1720 Siegel, J. M. (1990). Stressful life events and use of physician services among the elderly: the
 1721 moderating role of pet ownership. *Journal of personality and social psychology*,
 1722 58(6), 1081-1086. doi:10.1037//0022-3514.58.6.1081

1723 Simberloff, D. a., Parker, I. M. b., & Windle, P. N. c. (2005). Introduced species policy,
 1724 management, and future research needs. *Frontiers in Ecology and the Environment*,
 1725 3(1 SPEC. ISS.), 12-20.

1726 Soto, J. R., Escobedo, F. J., Khachatryan, H., & Adams, D. C. (2018). Consumer demand for
 1727 urban forest ecosystem services and disservices: Examining trade-offs using choice
 1728 experiments and best-worst scaling. *Ecosystem Services*, 29, 31-39.
 1729 doi:<https://doi.org/10.1016/j.ecoser.2017.11.009>

1730 Subroy, V., Rogers, A. A., & Kragt, M. E. (2018). To Bait or Not to Bait: A Discrete Choice
 1731 Experiment on Public Preferences for Native Wildlife and Conservation Management
 1732 in Western Australia. *Ecological Economics*, 147, 114-122.
 1733 doi:<https://doi.org/10.1016/j.ecolecon.2017.12.031>

1734 Suzuki, T., & Ikeda, T. (2019). Challenges in managing invasive raccoons in Japan. *Wildlife*
 1735 *Research*, 46(6), 476-483.

1736 Tenter, A. M. (2009). *Toxoplasma gondii* in animals used for human consumption. *Memórias*
 1737 *do Instituto Oswaldo Cruz*, 104(2), 364-369. doi:10.1590/S0074-02762009000200033

1738 Tershy, B. R., Donlan, C. J., Keitt, B. S., Croll, D. A., Sanchez, J. A., Wood, B., . . .
 1739 Biavaschi, N. (2002). Island conservation in north-west Mexico: a conservation model
 1740 integrating research, education and exotic mammal eradication. *Turning the tide: the*
 1741 *eradication of invasive species*, 293-300.

1742 Torrey, E. F., Bartko, J. J., Lun, Z. R., & Yolken, R. H. (2007). Antibodies to *Toxoplasma*
 1743 *gondii* in patients with schizophrenia: A meta-analysis. *Schizophrenia Bulletin*, 33(3),
 1744 729-736. doi:10.1093/schbul/sbl050
 1745 Toukhsati, S. R., Phillips, C. J. C., Podberscek, A. L., & Coleman, G. J. (2012). Semi-
 1746 ownership and sterilisation of cats and dogs in Thailand. *Animals*, 2(4), 611-627.
 1747 doi:10.3390/ani2040611
 1748 Tsuge, T., Nakamura, S., & Usio, N. (2014). Assessing the Difficulty of Implementing
 1749 Wildlife-Friendly Farming Practices by Using the Best–Worst Scaling Approach. In
 1750 N. Usio & T. Miyashita (Eds.), *Social-Ecological Restoration in Paddy-Dominated*
 1751 *Landscapes* (pp. 223-236). Tokyo: Springer Japan.
 1752 Tyner, E. H., & Boyer, T. A. (2020). Applying best-worst scaling to rank ecosystem and
 1753 economic benefits of restoration and conservation in the Great Lakes. *Journal of*
 1754 *Environmental Management*, 255, 109888.
 1755 doi:<https://doi.org/10.1016/j.jenvman.2019.109888>
 1756 Uetake, K., Yamada, S., Yano, M., & Tanaka, T. (2014). A Survey of Attitudes of Local
 1757 Citizens of a Residential Area Toward Urban Stray Cats in Japan. *Journal of Applied*
 1758 *Animal Welfare Science*, 17(2), 172-177. doi:10.1080/10888705.2013.798558
 1759 U.S. Fish and Wildlife Service. (2012). The Cost of Invasive Species,
 1760 <https://www.fws.gov/verobeach/PythonPDF/CostofInvasivesFactSheet.pdf>
 1761 Veitch, C. R. (2001). The eradication of feral cats (*Felis catus*) from Little Barrier Island,
 1762 New Zealand. *New Zealand Journal of Zoology*, 28(1), 1-12.
 1763 doi:10.1080/03014223.2001.9518252
 1764 Vitousek, P. M., Mooney, H. A., Lubchenco, J., & Melillo, J. M. (1997). Human Domination
 1765 of Earth's Ecosystems. *Science*, 277(5325), 494. doi:10.1126/science.277.5325.494

- 1766 Wald, D. M., & Jacobson, S. K. (2013). Factors Affecting Student Tolerance for Free-
 1767 Roaming Cats. *Human Dimensions of Wildlife*, 18(April 2014), 263-278.
 1768 doi:10.1080/10871209.2013.787660
- 1769 Wald, D. M., & Jacobson, S. K. (2014). A multivariate model of stakeholder preference for
 1770 lethal cat management. *PLoS ONE*, 9(4), 1-9. doi:10.1371/journal.pone.0093118
- 1771 Wald, D. M., Jacobson, S. K., & Levy, J. K. (2013). Outdoor cats: Identifying differences
 1772 between stakeholder beliefs, perceived impacts, risk and management. *Biological*
 1773 *Conservation*, 167, 414-424. doi:10.1016/j.biocon.2013.07.034
- 1774 Wald, D. M., Lohr, C. A., Lepczyk, C. A., Jacobson, S. K., & Cox, L. J. (2016). A
 1775 comparison of cat-related risk perceptions and tolerance for outdoor cats in Florida
 1776 and Hawaii. *Conservation Biology*, 30(6), 1233-1244. doi:10.1111/cobi.12671
- 1777 Wallach, A. D., Lundgren, E. J., Ripple, W. J., & Ramp, D. (2018). Invisible megafauna.
 1778 *Conservation Biology*, 32(4), 962-965. doi:https://doi.org/10.1111/cobi.13116
- 1779 Walsh, R. G., Loomis, J. B., & Gillman, R. A. (1984). Valuing Option, Existence, and
 1780 Bequest Demands for Wilderness. *Land Economics*, 60(1), 14-29.
 1781 doi:10.2307/3146089
- 1782 Wilcove, D. S., Rothstein, D., Dubow, J., Phillips, A., & Losos, E. (1998). Quantifying
 1783 Threats to Imperiled Species in the United States. *BioScience*, 48(8), 607-615.
 1784 doi:10.2307/1313420
- 1785 Wood, L., Giles-Corti, B., Bulsara, M., & Bosch, D. (2007). More Than a Furry Companion:
 1786 The Ripple Effect of Companion Animals on Neighborhood Interactions and Sense of
 1787 Community. *Society & Animals*, 15(1), 43-56.
 1788 doi:http://dx.doi.org/10.1163/156853007X169333
- 1789 Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data* MIT Press.
 1790 Cambridge, MA, 108.

1791 Yamada, F., Sugimura, K., 2008. *Pentalagus furnessi*. The IUCN Red List of Threatened
 1792 Species 2008: e.T16559A6063719.
 1793 <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T16559A6063719.en>
 1794 Yee, T. W. (2020). VGAM: Vector generalized linear and additive models, R package
 1795 version 1.1-3, <http://www.stat.auckland.ac.nz/yee/VGAM>
 1796 Baker, P. J., Bentley, A. J., Ansell, R. J., & Harris, S. (2005). Impact of predation by
 1797 domestic cats *Felis catus* in an urban area. *Mammal Review*, 35(3-4), 302-312.
 1798 doi:DOI 10.1111/j.1365-2907.2005.00071.x
 1799 Bester, M. N., Bloomer, J. P., Van Aarde, R. J., Erasmus, B. H., Van Rensburg, P. J. J.,
 1800 Skinner, J. D., . . . Naude, T. W. (2002). A review of the successful eradication of
 1801 feral cats from sub-Antarctic Marion Island, Southern Indian Ocean. *South African*
 1802 *Journal of Wildlife Research*-24-month delayed open access, 32(1), 65-73.
 1803 Birkenheuer, A. J., Le, J. A., Valenzisi, A. M., Tucker, M. D., Levy, M. G., & Breitschwerdt,
 1804 E. B. (2006). *Cytauxzoon felis* infection in cats in the mid-Atlantic states: 34 cases
 1805 (1998–2004). *Journal of the American Veterinary Medical Association*, 228(4), 568-
 1806 571. doi:10.2460/javma.228.4.568
 1807 Blanton, J. D., Palmer, D., Dyer, J., & Rupprecht, C. E. (2011). Rabies surveillance in the
 1808 United States during 2010. *Journal of the American Veterinary Medical Association*,
 1809 239(6), 773-783. doi:10.2460/javma.239.6.773
 1810 Bonnaud, E., Medina, F. M., Vidal, E., Nogales, M., Tershy, B., Zavaleta, E., . . . Horwath, S.
 1811 V. (2011). The diet of feral cats on islands: a review and a call for more studies.
 1812 *Biological Invasions*, 13(3), 581-603. doi:10.1007/s10530-010-9851-3
 1813 Campbell, K., Harper, G., Algar, D., Hanson, C. C., Keitt, B. S., & Robinson, S. (2011).
 1814 Review of feral cat eradications on islands. *Island Invasives: Eradication and*
 1815 *Management*’. (Eds CR Veitch, MN Clout and DR Towns.) pp, 37-46.

1816 Dabritz, H. a., Atwill, E. R., Gardner, I. a., Miller, M. a., & Conrad, P. a. (2006). Outdoor
 1817 fecal deposition by free-roaming cats and attitudes of cat owners and nonowners
 1818 toward stray pets, wildlife, and water pollution. *Journal of the American Veterinary*
 1819 *Medical Association*, 229(1), 74-81. doi:10.2460/javma.229.1.74
 1820 Doherty, T. S., Glen, A. S., Nimmo, D. G., Ritchie, E. G., & Dickman, C. R. (2016). Invasive
 1821 predators and global biodiversity loss. *Proceedings of the National Academy of*
 1822 *Sciences*, 113(40), 11261. doi:10.1073/pnas.1602480113
 1823 Flux, J. E. C. (1993). Relative effect of cats, myxomatosis, traditional control, or competitors
 1824 in removing rabbits from islands. *New Zealand Journal of Zoology*, 20(1), 13-18.
 1825 doi:10.1080/03014223.1993.10423238
 1826 Ford-Thompson, A. E. S., Snell, C., Saunders, G., & White, P. C. L. (2012). Stakeholder
 1827 Participation in Management of Invasive Vertebrates. *Conservation Biology*, 26(2),
 1828 345-356. doi:https://doi.org/10.1111/j.1523-1739.2011.01819.x
 1829 Halfmann, P. J., Hatta, M., Chiba, S., Maemura, T., Fan, S., Takeda, M., . . . Kawaoka, Y.
 1830 (2020). Transmission of SARS-CoV-2 in Domestic Cats. *New England Journal of*
 1831 *Medicine*. doi:10.1056/NEJMc2013400
 1832 Lepczyk, C. A., Mertig, A. G., & Liu, J. (2004). Landowners and cat predation across rural-
 1833 to-urban landscapes. *Biological Conservation*, 115(2), 191-201. doi:10.1016/S0006-
 1834 3207(03)00107-1
 1835 Levy, J. K., & Crawford, P. C. (2004). Humane strategies for controlling feral cat
 1836 populations. *Journal of the American Veterinary Medical Association*, 225(9), 1354-
 1837 1360. doi:10.2460/javma.2004.225.1354
 1838 Loss, S. R., Will, T., & Marra, P. P. (2013). The impact of free-ranging domestic cats on
 1839 wildlife of the United States. *Nature Communications*, 4, 1396-1396.
 1840 doi:10.1038/ncomms2380

1841 Lowe, S., Browne, M., Boudjelas, S., & De Poorter, M. (2000). 100 of the world's worst
 1842 invasive alien species: a selection from the global invasive species database (Vol. 12):
 1843 Invasive Species Specialist Group Auckland.
 1844 Loyd, K. A. T., Hernandez, S. M., Abernathy, K. J., Shock, B. C., & Marshall, G. J. (2013).
 1845 Risk behaviours exhibited by free-roaming cats in a suburban US town. *Veterinary*
 1846 *Record*, 173(12), 295. doi:10.1136/vr.101222
 1847 Mameno, K., Kubo, T., Shoji, Y., & Tsuge, T. (2020). How to Engage Tourists in Invasive
 1848 Carp Removal: Application of a Discrete Choice Model. In O. Saito, S. M.
 1849 Subramanian, S. Hashimoto, & K. Takeuchi (Eds.), *Managing Socio-ecological*
 1850 *Production Landscapes and Seascapes for Sustainable Communities in Asia: Mapping*
 1851 *and Navigating Stakeholders, Policy and Action* (pp. 31-44). Singapore: Springer
 1852 Singapore.
 1853 Mameno, K., Kubo, T., & Suzuki, M. (2017). Social challenges of spatial planning for
 1854 outdoor cat management in Amami Oshima Island, Japan. *Global Ecology and*
 1855 *Conservation*, 10, 184-193. doi:10.1016/j.gecco.2017.03.007
 1856 Maruyama, S., Kabeya, H., Nakao, R., Tanaka, S., Sakai, T., Xuan, X., . . . Mikami, T.
 1857 (2003). Seroprevalence of *Bartonella henselae*, *Toxoplasma gondii*, FIV and FeLV
 1858 Infections in Domestic Cats in Japan. *Microbiology and Immunology*, 47(2), 147-153.
 1859 doi:10.1111/j.1348-0421.2003.tb02798.x
 1860 McLeod, L. J., Hine, D. W., Bengsen, A. J., & Driver, A. B. (2017). Assessing the impact of
 1861 different persuasive messages on the intentions and behaviour of cat owners: A
 1862 randomised control trial. *Preventive Veterinary Medicine*, 146, 136-142.
 1863 doi:https://doi.org/10.1016/j.prevetmed.2017.08.005
 1864 Medina, F. M., Bonnaud, E., Vidal, E., Tershy, B. R., Zavaleta, E. S., Josh Donlan, C., . . .
 1865 Nogales, M. (2011). A global review of the impacts of invasive cats on island

1866 endangered vertebrates. *Global Change Biology*, 17(11), 3503-3510.

1867 doi:10.1111/j.1365-2486.2011.02464.x

1868 Nogales, M., Martín, A., Tershy, B. R., Donlan, C. J., Veitch, D., Puerta, N., . . . Alonso, J.

1869 (2004). A review of feral cat eradication on islands. *Conservation Biology*, 18(2),

1870 310-319. doi:10.1111/j.1523-1739.2004.00442.x

1871 Patrick, G. R., & O'Rourke, K. M. (1998). Dog and cat bites: epidemiologic analyses suggest

1872 different prevention strategies. *Public health reports*, 113(3), 252.

1873 Ratcliffe, N., Bell, M., Pelembe, T., Boyle, D., Benjamin, R., White, R., . . . Sanders, S.

1874 (2010). The eradication of feral cats from Ascension Island and its subsequent

1875 recolonization by seabirds. *Oryx*, 44(1), 20-29. doi:10.1017/S003060530999069X

1876 Rochlitz, I. (2003). Study of factors that may predispose domestic cats to road traffic

1877 accidents: part 1. *Veterinary Record*, 153(18), 549. doi:10.1136/vr.153.18.549

1878 Spatz, D. R., Zilliacus, K. M., Holmes, N. D., Butchart, S. H. M., Genovesi, P., Ceballos,

1879 G., . . . Croll, D. A. (2017). Globally threatened vertebrates on islands with invasive

1880 species. *Science Advances*, 3(10), e1603080. doi:10.1126/sciadv.1603080

1881 Toukhsati, S. R., Phillips, C. J. C., Podberscek, A. L., & Coleman, G. J. (2012). Semi-

1882 ownership and sterilisation of cats and dogs in Thailand. *Animals*, 2(4), 611-627.

1883 doi:10.3390/ani2040611

1884 Wright, J. C. (1990). Reported cat bites in Dallas: characteristics of the cats, the victims, and

1885 the attack events. *Public Health Reports*, 105(4), 420.

1886 Yamaguchi, N., Macdonald, D. W., Passanisi, W. C., Harbour, D. A., & Hopper, C. D.

1887 (1996). Parasite prevalence in free-ranging farm cats, *Felis silvestris catus*.

1888 *Epidemiology and Infection*, 116(2), 217-223. doi:10.1017/S0950268800052468

Appendix 1. The questionnaire using the research in chapter 2

調査日: / 実施場所:

奄美大島のネコに関する聞き取り調査

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問1. あなた(もしくはあなたの同居しているご家族)は、これまでにネコをペットとして飼ったことがありますか? 当てはまる番号1つに○をつけて下さい。

「1. 現在飼っている」「2. 過去に飼っていた」とお答えの方は問2へ、「3. 飼ったことはない」「4. わからない」とお答えの方は問3へお進み下さい。

1. 現在飼っている 2. 過去に飼っていた 3. 飼ったことはない 4. わからない

↓ 問2へお進み下さい。

↓ 問3へお進み下さい

問2. 問1で「1. 現在飼っている」「2. 過去に飼っていた」とお答えの方にお聞きます。

あなたのネコは、野外で生き物を捕まえて家に持って帰ってきたことがありますか?

当てはまる番号1つに○をつけて下さい。また、「1. 持って帰ってきたことがある」とご回答の方は生き物の名前をわかる範囲でお答え下さい。

1. 持って帰ってきたことがある 2. 持って帰ってきたことはない 3. わからない

↓ 具体的な生き物の名前()

問3. あなたは、以下の3つの場所にいるネコの存在をどのように考えますか? 市街地(名瀬・古仁屋)、郊外・集落、奥山(林道含む)の3つそれぞれに、当てはまる番号1つに○をつけて下さい。

	市街地(名瀬・古仁屋)					郊外・集落					奥山(林道含む)				
自然度	低										高				
	望ましくない ⇄ 望ましい					望ましくない ⇄ 望ましい					望ましくない ⇄ 望ましい				
ネコの存在	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

問4. あなたは、以下の3つの場所にいるネコに対して餌付けすること、また、ネコに対してどのような管理が望ましいと考えますか? 市街地(名瀬・古仁屋)、郊外・集落、奥山(林道含む)の3つそれぞれに、当てはまる番号1つに○をつけて下さい。

	市街地(名瀬・古仁屋)					郊外・集落					奥山(林道含む)				
自然度	低										高				
	望ましくない ⇄ 望ましい					望ましくない ⇄ 望ましい					望ましくない ⇄ 望ましい				
ネコへの餌付け	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
捕獲し里親探し	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
捕獲し不妊手術を行い放獣	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
捕獲し殺処分	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

問5. あなたは、野生化し奥山で生息しているネコ(ノネコ)が、奄美大島に生息していることをご存知でしたか? 当てはまる番号1つに○をつけて下さい。但し、ノネコとは、市街地や集落などで人間に依存し生活している野良猫と異なり、人間生活に頼らず狩りを行うことで生きているネコを指します。

1. 前から知っていた 2. 今、初めて知った 3. わからない

問6. あなたは、奄美大島において野生化し奥山で生息しているネコ（ノネコ）により希少種の捕食が起きていますが、どのように考えますか？ 当てはまる番号1つに○をつけて下さい。

- | | | | | |
|------------|----------|-------------|----------|-------------|
| 1. 全く問題でない | 2. 問題でない | 3. どちらも言えない | 4. 問題である | 5. とても問題である |
|------------|----------|-------------|----------|-------------|

問7. あなたは、山の中・林道・集落間の県道などでノネコを見たことがありますか？ 当てはまる番号1つに○をつけて下さい。また、「1.見たことがある」とお答えの方は、見た場所もお答えください。

- | | | |
|---------------------------------------|------------|----------|
| 1. 見たことがある（場所： ） | 2. 見たことはない | 3. わからない |
|---------------------------------------|------------|----------|

問8. あなたは、奄美大島に「飼い猫」に関する条例があることをご存知でしたか？ 当てはまる番号1つに○をつけて下さい。

- | | | |
|-------------|-------------|----------|
| 1. 前から知っていた | 2. 今、初めて知った | 3. わからない |
|-------------|-------------|----------|

* “飼い猫”に関する条例とは、「飼い猫の適正な飼養及び管理に関する条例」のこととします。

問9. 昨今、多くの都道府県において野良猫への餌やりを禁止する条例が話題となっています。あなたは、野良猫への餌やりを禁止する条例に関して、賛成しますか、反対しますか？ 当てはまる番号1つに○をつけて下さい。

- | | | | | |
|--------------|----------|-------------|----------|--------------|
| 1. 禁止にとっても反対 | 2. 禁止に反対 | 3. どちらも言えない | 4. 禁止に賛成 | 5. 禁止にとっても賛成 |
|--------------|----------|-------------|----------|--------------|

問10. あなたは、一般的に飼い猫を放し飼いすることを望ましいと思いますか、望ましくないと思いますか？ 当てはまる番号1つに○をつけて下さい。

- | | | | | |
|-------------|-----------|-------------|---------|------------|
| 1. 全く望ましくない | 2. 望ましくない | 3. どちらも言えない | 4. 望ましい | 5. とても望ましい |
|-------------|-----------|-------------|---------|------------|

問11. あなたの性別・年齢・お住まいについて、それぞれ当てはまる番号1つに○をつけて下さい。

- | | |
|--|--|
| 1. 男性 2. 女性 | |
| 1. 10代 2. 20代 3. 30代 4. 40代 5. 50代 | |
| 6. 60代 7. 70代 8. 80代 9. 90代 10. 100歳以上 | |
| 1. 奄美市（名瀬, 地名： ） | 2. 奄美市（笠利） 3. 奄美市（住用） 4. 大和村 |
| 5. 宇検村 6. 龍郷町 7. 瀬戸内町（地名： ） | 8. その他（ ） |

問12. あなたの現在の家族構成（人数）について、当てはまる番号1つに○をつけて下さい。

- | |
|--|
| 1. 1人暮らし 2. 2人暮らし 3. 3人暮らし 4. 4人暮らし 5. 5人暮らし |
| 6. 6人暮らし 7. 7人暮らし以上（具体的に 人） |

問13. あなたは、どのような目的で山や森林に行かれますか？ 当てはまる番号すべてに○をつけて下さい。

- | | | | |
|-----------|-----------|----------------|--------------------------------|
| 0. 行かない | 1. 農林作業 | 2. 狩猟（ハブ獲りも含む） | 3. 山菜採り |
| 4. 森林浴や散歩 | 5. ガイドや案内 | 6. 信仰 | 7. その他（ ） |

問14. あなたは、次の生き物を野外で見たことはありますか？ 当てはまる番号すべてに○をつけて下さい。

- | | | |
|---------------|---------------|---------------|
| 0. なし | 1. アマミノクロウサギ | 2. ケナガネズミ |
| 3. アマミトゲネズミ | 4. オオトラツグミ | 5. アマミヤマシギ |
| 6. リュウキュウイノシシ | 7. アマミイシカワガエル | 8. アマミハナサキガエル |

問15. あなたは、ノネコ問題に対してどのようにお考えになりますか？

(	)
(	)
(	)

問16. あなたは、奄美の自然・奄美の野生の生き物に対してどのようなイメージをお持ちですか？
3つあげて下さい。

(	)
(	)
(	)

これで聞き取りは終了です。ご協力ありがとうございます。

****その他、ご意見のある方は以下の空白にお書きください****

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調査員記入欄 8月____日 □

タイプA

奄美大島の自然と観光に関するアンケート調査

この調査は、奄美大島に来られた皆様の自然と観光へのご関心を把握することを目的に実施しております。回答用紙が 8 ページあり、資料として別紙の地図が 1 枚ございます。回答用紙のみ封筒に入れてご投函下さい。回答結果は集計されたもののみを用いますので、個別の回答内容が公表されることはありません。ご協力よろしくお願い致します。

北海道大学・京都大学・国立環境研究所（担当：久保雄広 029-850-2897）

問1 あなたは、今回のご訪問を含めて、過去 1 年間（2014 年 8 月～2015 年 8 月）に、奄美大島を何回訪れたことがありますか？ 当てはまる番号 1 つに○をつけて下さい。

1. 一回(初めて) 2. 二回 3. 三回 4. 四回 5. 五回 6. 六回以上(具体的に 回)

問2 あなたは、今回のご訪問を含めて、これまでに奄美大島を何回訪れたことがありますか？ 当てはまる番号 1 つに○をつけて下さい。

1. 一回(初めて) 2. 二回 3. 三回 4. 四回 5. 五回 6. 六回以上(具体的に 回)

問3 あなたは今回のご旅行で奄美群島の奄美大島以外の離島を訪れましたか？ 別紙の地図を参考に、訪れた離島について、当てはまるアルファベットすべてに○をつけて下さい。

O. 奄美大島以外に訪れた離島はない

a. 加計呂麻島 b. 与路島 c. 請島 d. 喜界島 e. 徳之島 f. 沖永良部島 g. 与論島
h. その他(具体的に：)

問4 あなたは、今回のご旅行で奄美大島のどちらの観光地を訪れましたか？ 別紙の地図を参考に、今回のご旅行で訪問した観光地について、当てはまる番号すべてに○をつけて下さい。

O. 今回の旅行で観光はしていない

1. 奄美観光ハブセンター 2. 奄美博物館 3. 大浜海浜公園 4. 金作原原生林
5. 奄美自然観察の森 6. 奄美大島酒造 7. 大島紬村 8. ハートロック
9. 蒲生崎観光公園 10. 崎原海岸 11. あやまる岬 12. 土盛海岸
13. 奄美パーク 14. 田中一村記念美術館 15. 原ハブ屋
16. マングローブ原生林 17. マングローブパーク 18. 高知山展望台
19. せとうち海の駅 20. ホノホシ海岸 21. ヤドリ浜
22. 諸鈍デイゴ並木 23. 湯湾岳 24. 枝手久島
25. 奄美野生生物保護センター 26. 奄美フォレストポリス 27. マテリアの滝
28. その他(具体的に：)

問5 あなたは、今回の奄美大島へのご訪問中に、どのようなレクリエーション体験・観光体験をしましたか？ 下記の中から当てはまる番号すべてに○をつけて下さい。

0. レクリエーション体験はしていない			
1. 海水浴	2. シュノーケリング	3. ダイビング	4. マングローブカヌー
5. シーカヤック	6. サーフィン	7. 釣り	8. ハイキング
9. 森林浴	10. パラグライダー	11. ドライブ	12. ツーリング
13. 浜辺の生きもの観察	14. 泥染め体験	15. 黒糖焼酎工場見学	
16. 織物体験	17. その他(具体的に：		

問6 あなたは、今回のご旅行で地元のガイド事業者による「ガイドツアー」に参加しましたか？
当てはまる番号すべてに○をつけて下さい。

また、「ガイドツアー」に参加した方は、選択したツアーの番号と料金を記入した後、そのツアーについて、また参加したいと思うか、当てはまる番号 1 つに○をつけて下さい。

0. ガイドツアーには参加していない (→ 問7へ)			
1. 金作原原生林探訪	2. シュノーケリング	3. ダイビング	4. マングローブカヌー
5. シーカヤック	6. 釣り	7. ナイトツアー	8. その他(具体的に：



ツアー番号	1人あたりの料金	また参加したいですか？
_____	_____ 円	1. 参加したい 2. 参加したくない
_____	_____ 円	1. 参加したい 2. 参加したくない
_____	_____ 円	1. 参加したい 2. 参加したくない

問7 あなたが、奄美大島で見た野生動物は何ですか？「ガイドツアー」で見た野生動物と「ガイドツアー」以外で見た野生動物に関して、それぞれ当てはまる番号すべてに○をつけて下さい。

ガイドツアー で見た 野生動物	1. アマミノクロウサギ 2. アマミヤマシギ 3. オオトラツグミ 4. イシカワガエル 5. オットンガエル 6. アカウミガメ 7. アオウミガメ 8. その他(具体的に：
ガイドツアー 以外で見た 野生動物	1. アマミノクロウサギ 2. アマミヤマシギ 3. オオトラツグミ 4. イシカワガエル 5. オットンガエル 6. アカウミガメ 7. アオウミガメ 8. その他(具体的に：

続いて、奄美大島の自然についてお伺いします。

問8 あなたが、奄美大島で大切だと思う自然環境は何ですか？ 当てはまる番号すべてに○をつけて下さい。

1. 森林や山	2. 畑や農地	3. 河川	4. 外海
5. サンゴ礁	6. 砂浜	7. 磯	8. 藻場
9. マングローブ林	10. 希少な動植物	11. その他（	

問9 あなたは、この島(奄美大島)の自然に対してどのようにお考えですか？ それぞれ当てはまる番号1つに○をつけて下さい。

	全くそう 思わない	←	どちらとも 言えない	→	とても そう思う
私はこの島の自然に愛着を感じている	1.	2.	3.	4.	5.
もしこの島特有の動植物がいなくなったら、私の島への愛着は薄れると思う	1.	2.	3.	4.	5.
この島の自然に囲まれていると私は心がなごむ	1.	2.	3.	4.	5.
この島の自然の中にいる時、私は自然と一体感を感じる	1.	2.	3.	4.	5.
この島の自然の中で過ごしていると、自分自身について数多くの発見がある	1.	2.	3.	4.	5.

問10 あなたは将来、また奄美大島を訪れたいと思いますか？ 当てはまる番号 1 つに○をつけて下さい。

1. 全く 訪れたくない	2. 訪れたくない	3. どちらとも 言えない	4. 訪れたい	5. 必ず 訪れたい
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ここから先は特にアマミノクロウサギの観察ツアーに関して、あなたの経験や関心をお聞きます。

これまでに観察ツアーに参加したかどうかにかかわらずお答え下さい。

アマミノクロウサギは、奄美群島にしか生息していない希少な野生動物です。アマミノクロウサギの観察ツアーとは夜間に車でアマミノクロウサギを見に行くガイドツアーです。ツアー時間は 2-3 時間、専門のガイドによる説明を聞きながらアマミノクロウサギを観察します。しかし、野生のアマミノクロウサギを観察するため、当日の気象条件等により、アマミノクロウサギが観察できないこともあります。



アマミノクロウサギ

問11 あなたはこのような『アマミノクロウサギ観察ツアー』に興味はありますか？
ツアーの値段は別として、当てはまる番号 1 つに○をつけて下さい。

1. 全く 興味がない	2. 興味がない	3. どちらとも 言えない	4. 興味がある	5. とても 興味がある
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ここからは、仮にあなたが奄美大島に再度訪れることになったとしてお答え下さい。
以下では「ウサギが見られる確率」「ツアー参加費」「返金保証」の3つの項目からなるツアーの組み合わせをお見せします。あなたはそこから望ましいツアーを選んで下さい。

まず、ツアー項目の中身について詳しく、ご説明します。

- ウサギが見られる確率 ツアーに参加した場合にアマミノクロウサギが見られる確率
- ツアー参加費 税・保険料込みのツアー参加料金
- 見られなかった時の返金 アマミノクロウサギが観察できなかった時に返金する割合

例えば、下の記入例ツアー①は、ウサギが見られる確率「60%」、ツアー参加費「2,000 円」、見られなかった時の返金「1 割」です。ツアーに 10 回参加すれば 6 回アマミノクロウサギを見られる 2,000 円のツアーで、もしアマミノクロウサギが見られなかった場合には 1 割（200 円）の返金が保証されています。

記入例

回答例	ツアー①	ツアー②	参加しない
ウサギが見られる確率 	60%見られる	40%見られる	
ツアー金額 	2,000 円	5,000 円	ツアーに参加しない
見られなかった時の返金 	1 割	9 割	
最も望ましい番号に ○をつけて下さい⇒	1	2	3

最も望ましい選択肢の番号に○を

ここから先では、上のような組み合わせを 5 回（問 12-問 16）お見せします。記入例が示すようにそれぞれの組み合わせの中で、最も望ましい選択肢の番号 1 つに○をつけて下さい。回答の際には、ツアーを選択すると、参加費分の支出をどこかで減らす必要があることを考慮してご回答ください。

問12①回目です。次の組み合わせの中で、最も望ましい選択肢の番号 1 つに○をつけて下さい。

①回目	ツアー①	ツアー②	参加しない
ウサギが見られる確率 	90%見られる	10%見られる	
ツアー金額 	3,000 円	10,000 円	ツアーに参加しない
見られなかった時の返金 	9 割	5 割	
最も望ましい番号に ○をつけて下さい⇒	1	2	3

問13 ②回目です。次の組み合わせの中で、最も望ましい選択肢の番号 1 つに○をつけて下さい。

②回目	ツアー①	ツアー②	参加しない
ウサギが見られる確率 	70%見られる	30%見られる	ツアーに 参加しない
ツアー金額 	8,000 円	5,000 円	
見られなかった時の返金 	1 割	5 割	
最も望ましい番号に ○をつけて下さい⇒	1	2	3

問14 ③回目です。次の組み合わせの中で、最も望ましい選択肢の番号 1 つに○をつけて下さい。

③回目	ツアー①	ツアー②	参加しない
ウサギが見られる確率 	70%見られる	30%見られる	ツアーに 参加しない
ツアー金額 	3,000 円	8,000 円	
見られなかった時の返金 	5 割	5 割	
最も望ましい番号に ○をつけて下さい⇒	1	2	3

問15 ④回目です。次の組み合わせの中で、最も望ましい選択肢の番号 1 つに○をつけて下さい。

④回目	ツアー①	ツアー②	参加しない
ウサギが見られる確率 	10%見られる	90%見られる	ツアーに 参加しない
ツアー金額 	1,000 円	10,000 円	
見られなかった時の返金 	1 割	1 割	
最も望ましい番号に ○をつけて下さい⇒	1	2	3

問16 ⑤回目です。次の組み合わせの中で、最も望ましい選択肢の番号 1 つに○をつけて下さい。

⑤回目	ツアー①	ツアー②	参加しない
ウサギが見られる確率 	90%見られる	10%見られる	ツアーに 参加しない
ツアー金額 	8,000 円	3,000 円	
見られなかった時の返金 	5 割	9 割	
最も望ましい番号に ○をつけて下さい⇒	1	2	3

ここでは国立公園・世界自然遺産についてお聞きします。

問17あなたは、奄美大島の一部が奄美群島国立公園に登録されていることを以前からご存知でしたか？ 当てはまる番号 1 つに○をつけて下さい。

1. 知っていた 2. 知らなかった

※奄美群島国立公園は奄美群島 12 市町村にまたがる、計 7,861ha の自然保護区です。

問18あなたは、奄美群島が国立公園および世界自然遺産の候補地になっていることをご存知でしたか？ 当てはまる番号 1 つに○をつけて下さい。

1. 国立公園・世界自然遺産の両方に関して知っていた
2. 国立公園に関してのみ、知っていた
3. 世界自然遺産に関してのみ、知っていた
4. 国立公園・世界自然遺産のどちらに関しても知らなかった

※ 奄美群島は国立公園への指定、世界自然遺産への登録を目指しています。

問19あなたは、奄美大島を含む奄美・琉球諸島が世界自然遺産へ登録されることを望ましいと思いますか？ 当てはまる番号 1 つに○をつけて下さい。

1. 全く望ましくない 2. 望ましくない 3. どちらとも言えない 4. 望ましい 5. とても望ましい

ここでは奄美大島の野外で生息するネコについてお聞きします。

奄美大島では昨今、野外に生息するネコがアマミノクロウサギなどの希少な野生動物を襲うことが問題となっています。

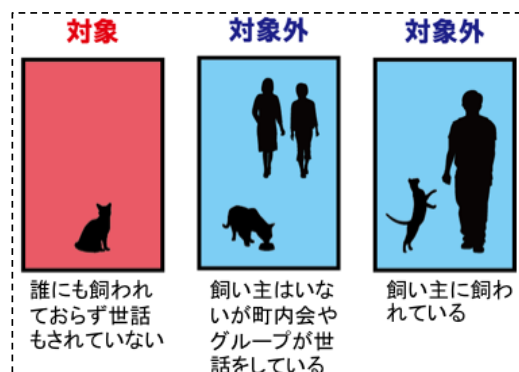
問20あなたは、今回のご旅行中に野外でネコを見ましたか？ ネコを見た場所について、当てはまる番号すべてに○をつけて下さい。

0. ネコは見えていない
1. 住宅地 2. 飲み屋街等の繁華街 3. 県道などの道路脇 4. ビーチなどの海岸・浜辺
5. 田畑などの耕作地 6. 森林の中などの山奥 7. その他（ ）

上記の問題を背景に、奄美大島では野外に生息するネコの数を減らすことが求められています。ここから先、野外に生息するネコとは、右図のように「誰にも飼われておらず、世話もされていない」ネコと考えてご回答下さい。

問21あなたは、奄美大島で野外に生息するネコの数を減らすことを望ましいと思いますか？ 当てはまる番号 1 つに○をつけて下さい。

1. 全く望ましくない 2. 望ましくない 3. どちらとも言えない 4. 望ましい 5. とても望ましい



問22 あなたは、野外に生息するネコの数減らすために、以下のような対策や管理は望ましいと思いますか？ それぞれ当てはまる番号1つに○をつけて下さい。

	全く望ましくない	←	どちらとも言えない	→	とても望ましい
ネコを捕獲し、飼い猫(ペット)として飼育する	1.	2.	3.	4.	5.
ネコを捕獲し、島内の施設で飼育する	1.	2.	3.	4.	5.
ネコを捕獲し、殺処分する	1.	2.	3.	4.	5.

以下では、上で述べた3つの対策や管理のうち、具体的に皆様にご協力頂くことを検討している『ネコを捕獲し、飼い猫(ペット)として飼育する』対策について、皆様のご意見をお伺いします。

問23 あなたは、奄美大島で捕獲されたネコをご自身で引き受けたい(ペットとして飼育したい)と思いますか？また、もし引き受けるなら何匹引き受けたいですか？ 当てはまる番号 1 つに○をつけて下さい。

- ① 0匹 (ネコを引き受けない)
 ① 1匹 ② 2匹 ③ 3匹 ④ 4匹 ⑤ 5匹 ⑥ 6匹 ⑦ 7匹以上(具体的に 匹)

もし、実際に上記の対策を実施することになった場合には、ネコ捕獲や一時的にネコを飼育する費用、新たな飼い主にネコを送るための輸送費など、対策や管理に関する様々な費用が掛かります。



問24 このような『ネコを捕獲し、飼い猫(ペット)として飼育する』対策にかかる費用を捻出するため、奄美大島において募金を集めているとします。あなたは、いくら募金しますか？あなたが募金してもよいと思う金額に一番近い金額を選んで1つ○をつけてください。

※なお募金をする、その金額だけ他に使えるお金が減ることを念頭にご回答下さい。

- ① 0円 (募金しない)
 ① 100円 ② 200円 ③ 300円 ④ 400円 ⑤ 500円 ⑥ 600円
 ⑦ 700円 ⑧ 800円 ⑨ 900円 ⑩ 1,000円 ⑪ 1,500円 ⑫ 2,000円
 ⑬ 3,000円 ⑭ 5,000円 ⑮ 10,000円 ⑯ 15,000円以上 (具体的に 円)

最後に皆さんについてお伺いします。

問25 あなたの性別と年齢について、それぞれ当てはまる番号1つに○をつけて下さい。

1. 男性 2. 女性

1. 十代 2. 二十代 3. 三十代 4. 四十代 5. 五十代 6. 六十代 7. 七十代以上

問26 あなたのご職業について、当てはまる番号すべてに○をつけて下さい。

1. 会社員 2. 公務員 3. 団体職員 4. 自営業 5. 農林水産業 6. 主婦・主夫
7. パート 8. 学生 9. 年金生活 10. その他(具体的に：)

問27 あなたのお住まいはどこですか？ 当てはまる番号 1 つに○をつけ、奄美群島にお住まいの方は市町村名を、奄美群島以外にお住まいの方は都道府県名をご記入下さい。

1. 奄美群島()市・町・村) 2. 奄美群島以外()都・道・府・県)

問28 今回のあなたの奄美大島までの交通手段について当てはまる番号1つに○をつけて下さい。

1. 飛行機(JAL・JAC) 2. 飛行機(バニラエア) 3. 船 4. その他

問29 あなたの奄美大島内での主な旅行形態について、当てはまる番号1つに○をつけて下さい。

1. 個人旅行 2. パックツアー 3. わからない 4. その他(具体的に：)

問30 今回のご旅行中の奄美大島内での主な交通手段について、当てはまる番号1つに○をつけて下さい。

1. レンタカー 2. 観光バス 3. 路線バス 4. 自分のオートバイ
5. レンタルオートバイ 6. 自家用車 7. 自分の自転車 8. レンタサイクル
9. 徒歩 10. タクシー 11. その他(具体的に：)

問31 今回のご旅行はあなたを含めて何名で来ましたか？ 当てはまる番号1つに○をつけて下さい。

1. 一人 2. 二人 3. 三人 4. 四人 5. 五人以上(具体的に：)名)

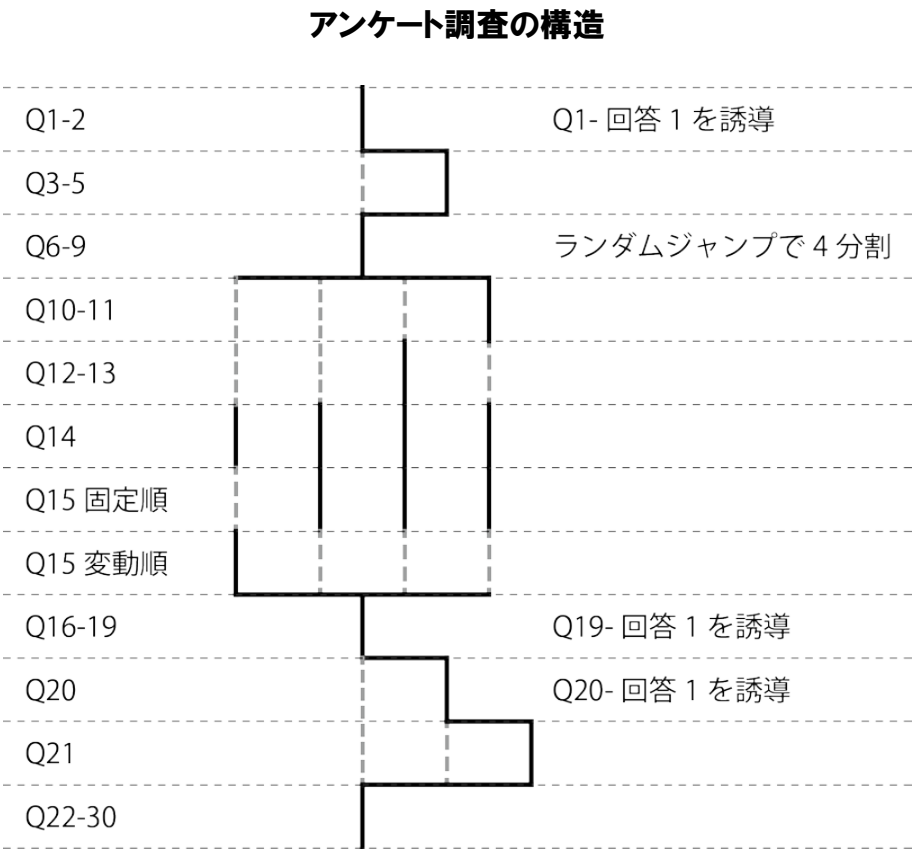
問32 今回はどのようなグループで来ましたか？ 当てはまる番号すべてに○をつけて下さい。

1. おひとり 2. 家族 3. 彼氏や彼女 4. 友人や知人 5. 地域や職場の仲間
6. その他(具体的に：)

問33 差し支えなければ、あなたのご家庭の年収(年金も含みます)について、当てはまる番号 1 つに○をつけて下さい。(この項目は社会経済的な統計分析を行うためのものです)

1. 200万円以下 2. 201-400万円 3. 401-600万円
4. 601-800万円 5. 801-1,000万円 6. 1,001-1,200万円
7. 1,201-1,400万円 8. 1,401-1,600万円 9. 1,601-1,800万円
10. 1,801万円以上(具体的に)万円程度)

以上で終了です。長時間にわたりご協力ありがとうございました。
ご記入頂いた回答用紙は封筒に入れてご投函下さい(切手は不要です)。



【当WEBシステム利用上の注意】

再ログイン時には下記ID番号、パスワードが必要です。
< ID番号、パスワードをメモしておくことをお勧めします >

ID番号:	\$Aid
パスワード:	\$Af

- 回答中に前ページに戻る際には、ページの一番下の「戻る」ボタンをクリックしてください。ブラウザの「戻る」ボタンは使用しないようご注意ください。
- 回答を途中で中断し、後で再開することも可能です。
中断する場合は、ページの一番下の「一時保存をして中断」ボタンをクリックして下さい。
- アンケートを再開される場合は、依頼メールに記載されているURLを再度クリックしていただくか、マイページの本アンケートへのリンクをクリックしてください。中断した箇所よりアンケートを再開します。
- 回答期間中は、土日も含め24時間回答可能です。
- 推奨ブラウザはWindowsでは「Internet Explorer 6～11」です。これ以外のブラウザでは回答時にエラーが出る可能性があります。
- 一度、回答を完了すると再回答はできませんのでご注意下さい。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。

次へ

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(ファイル名 issue01.htm)

- 回答内容により質問番号が飛ぶことがありますが、気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)



Q1

あなたはこれまでにネコを飼ったことがありますか（あるいは飼っていますか）。 (ひとつだけ)

- ☐ 現在飼っている
- ☐ 現在は飼っていないが過去に飼ったことがある
- ☐ 飼ったことがない

Q2

あなたはネコが好きですか、嫌いですか。 (ひとつだけ)

とても嫌いである	←	←	どちらとも言えない	→	→	とても好きである
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

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次へ

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(ファイル名 q01.htm)

- 回答内容により質問番号が飛ぶことがあります。気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)



ネコの飼育と管理に関する調査

\$indicator

Q3

あなたはネコを何匹飼っていますか。

(ひとつだけ)

- ☐ 1匹
- ☐ 2匹
- ☐ 3匹以上

Q4

あなたはどのようにネコを飼っていますか。

(ひとつだけ)

- ☐ 屋内飼育のみ
- ☐ 屋内飼育と屋外飼育（屋内と屋外を行ったり来たりできる）
- ☐ 昼は屋外に外出させるが夜は屋内飼育
- ☐ 屋外飼育のみ

Q5

あなたのネコは避妊・去勢をされていますか。

(ひとつだけ)

- している（する予定である）
- していない（しない予定である）

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(ファイル名 q03.htm)

- 回答内容により質問番号が飛ぶことがあります。気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)



ネコの飼育と管理に関する調査

\$indicator

ネコは屋内でも飼えますし、屋外で外飼い（放し飼い）することもできます。
屋外にいるネコには、飼い主がいて外飼いされているネコの他に、飼い主から離れて屋外で生活するようになるものや、外
飼いされたネコ同士から生まれたネコのように、飼い主がいないネコもいます。

Q6

あなたは屋外にいるネコ（ネコを飼われている方は自分のネコ以外のネコ）のことを
どのように思いますか。 (それぞれひとつずつ)

	全く そう 思わ ない	←	←	ど ち ら と も 言 え な い	→	→	と て も そ う 思 う
	1	2	3	4	5	6	7
屋外でネコに頻繁に出会う	☐	☐	☐	☐	☐	☐	☐
屋外にいるネコに会うのは楽しい	☐	☐	☐	☐	☐	☐	☐
屋外にいるネコが増えたと思う	☐	☐	☐	☐	☐	☐	☐
屋外にいるネコは不快である	☐	☐	☐	☐	☐	☐	☐

Q7

あなたはこれまでに屋外にいるネコが鳥やネズミを捕えているのを見たことがありますか。 (ひとつだけ)

- ☐ ある
- ☐ ない

Q8

あなたはネコを屋外で外飼いすること（あるいは、外飼いされていること）を望ましいと思いますか、思いませんか。 (ひとつだけ)

とても望ましくない	←	←	どちらとも言えない	→	→	とても望ましい
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

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次へ

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(ファイル名 q06exp.htm)

- 回答内容により質問番号が飛ぶことがあります。気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)



ネコの飼育と管理に関する調査

\$indicator

Q9A

屋外にいるネコの存在は人間にとって望ましい面も望ましくない面もあります。あなたは以下に示される望ましい面と望ましくない面について、どのように思いますか。 (それぞれひとつずつ)

【望ましい面】

全くそう思わない	←	←	どちらとも言えない	→	→	とてもそう思う
----------	---	---	-----------	---	---	---------

	1	2	3	4	5	6	7
ネズミなどの害獣駆除に貢献している	☐	☐	☐	☐	☐	☐	☐
人間にいやしを与えている	☐	☐	☐	☐	☐	☐	☐
人間の動物を大切にすること（尊敬や配慮、同情）を育てている	☐	☐	☐	☐	☐	☐	☐

Q9B

【望ましくない面】

(それぞれひとつずつ)

	1	2	3	4	5	6	7
全くそう思わない		←	←		→	→	
ど ち ら と も 言 え な い							
と て も そ う 思 う							
糞尿の問題を引き起こしている	☐	☐	☐	☐	☐	☐	☐
ごみあさを引き起こしている	☐	☐	☐	☐	☐	☐	☐
人獣共通感染症（人間もネコも共通してかかる病気）を広めている*	☐	☐	☐	☐	☐	☐	☐

*例えば、ネコはトキソプラズマという病原体の感染源の一つになっています（ネコのふんに含まれていることがあります）。

妊娠中の女性がトキソプラズマに初めて感染すると、胎児が先天性トキソプラズマ症と呼ばれる病気になることがあります、障害が生じるような重篤な症状が現れることがあります。

ただ、先天性トキソプラズマ症となる確率は0.02%～0.04%（年間200～400人）と考えられており、トキソプラズマが病気の原因と特定しづらいこともあって、実際に先天性トキソプラズマ症と診断される患者数は年間5名程度と言われています。

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(ファイル名 q09a.htm)

- 回答内容により質問番号が飛ぶことがありますが、気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)

NIKKEI-R

屋外にいるネコは野生動物を捕まえますが、その中に絶滅しそうな野生動物が含まれていることが分かってきました。例えば、小笠原諸島（東京都）ではアカガシラカラスバトと呼ばれる希少な鳥がネコに捕えられていることが分かっています。アカガシラカラスバトは小笠原群島だけに40～60羽だけしかいないことから、国から絶滅危惧IA類という最も絶滅しそうな動物に指定されています。同じように奄美大島（鹿児島県）ではアマミノクロウサギと呼ばれる希少なウサギがネコに捕えられていることが分かっています。アマミノクロウサギも絶滅危惧IB類という、絶滅危惧IA類に次いで絶滅しそうな動物として指定されています。

Q10

あなたは、屋外にいるネコが以下に示す動物を捕えることを問題だと思いますか。 （それぞれひとつずつ）

	全く そう 思わ ない	←	←	ど ち ら と も 言 え な い	→	→	と て も さ う 思 う
	1	2	3	4	5	6	7
絶滅しそうな野生動物を捕えることは問題である	☐	☐	☐	☐	☐	☐	☐
絶滅しそうな野生動物以外の野生動物を捕えることは問題である	☐	☐	☐	☐	☐	☐	☐
人間に害を与える野生動物を捕えることは問題である	☐	☐	☐	☐	☐	☐	☐

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[一時保存をして中断](#)

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(ファイル名 q10exp.htm)

- 回答内容により質問番号が飛ぶことがあります。気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)



Q11

野生動物に関する質問にご回答された上で、先ほどと同じ質問を再度お聞きします。あなたはネコを屋外で外飼いすること（あるいは、外飼いされていること）を望ましいと思いますか、思いませんか。（ご回答は先ほどのご回答から変えられても、変えられなくてもどちらでも構いません）。 （ひとつだけ）

とても望ましくない	←	←	どちらとも言えない	→	→	とても望ましい
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

このページに入力したものを全てクリアする

戻る

次へ

一時保存をして中断

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(ファイル名 q11.htm)

- 回答内容により質問番号が飛ぶことがあります。気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)



ネコの飼育と管理に関する調査

\$indicator

屋外にいるネコは、人間に悪影響をもたらすだけでなく、ネコ自身も屋外にすることで危険にさらされていると言われています。
例えば、交通事故にあったり、野外にいるネコ同士のケンカによりケガをしたり、病気に感染したりする可能性があります。
特に日本では「猫後天性免疫不全症候群（猫エイズとも呼ばれるが、人間には感染しない）」と呼ばれる生死に関わる病気が流行しています。3割近いネコが猫後天性免疫不全症候群の原因となるウイルスに感染しているという報告もあります。

Q12

あなたは、屋外にいるネコが以下に示すような危険にさらされていると思いますか。 (それぞれひとつずつ)

全くそう思わない	←	←	どちらとも言えない	→	→	とてもそう思う
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

屋外にいるネコは交通事故にあう危険にさらされている	☐	☐	☐	☐	☐	☐	☐
屋外にいるネコはネコ同士のケンカによりケガする危険に	☐	☐	☐	☐	☐	☐	☐

さらされている							
屋外にいるネコは病気に感染する危険にさらされている	☐	☐	☐	☐	☐	☐	☐

このページに入力したものを全てクリアする

戻る

次へ

一時保存をして中断

\$hidden
(ファイル名 q12exp.htm)

- 回答内容により質問番号が飛ぶことがあります。気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)



ネコの飼育と管理に関する調査

\$indicator

Q13

ネコが屋外にいることの危険性に関する質問にご回答された上で、先ほどと同じ質問を再度お聞きします。

あなたはネコを屋外で外飼いすること（あるいは、外飼いされていること）を望ましいと思いますか、思いませんか。（ご回答は先ほどのご回答から変えられても、変えられなくてもどちらでも構いません）。

(ひとつだけ)

とても望ましくない	←	←	どちらとも言えない	→	→	とても望ましい
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

このページに入力したものを全てクリアする

戻る

次へ

一時保存をして中断

\$hidden
(ファイル名 q13.htm)

- 回答内容により質問番号が飛ぶことがあります。気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)



近年、様々な観点から屋外にいるネコを減らすための対策が求められています。ここからは仮のお話になります。あなたがお住まいの市町村が「〇〇という理由のため」に「屋外にいるネコをなくすキャンペーン」を始めたいと考えているとします（〇〇は後ほど説明致します）。このキャンペーンでは、屋外にいる「飼い主のいるネコ」は飼い主に屋内で飼ってもらい、「飼い主のいないネコ」は市町村が捕まえて、施設であずかって寿命を全うするまで飼育します。「〇〇という理由のため」の〇〇には以下に示す4つの理由が考えられます。

- 1.生物多様性の保全
- ネコが野生動物を捕えるのをなくし、生物多様性を保全するため
(ネコはネズミなどの害獣駆除に貢献している一方、様々な野生動物も捕えています)
- 2.人間の健康維持
- 人獣共通感染症（人間もネコも共通してかかる病気）から人間を守るため
- 3.地域の住環境維持
- ネコによる糞尿の問題やごみあさをなくするため
- 4.飼いネコの健康維持
- ネコの交通事故やネコ同士のケンカによるケガ、病気への感染をなくするため

Q14

「〇〇という理由のため」の〇〇の部分に、以下のそれぞれの理由が入っている場合、あなたは市町村を始めようとしている「屋外にいるネコをなくすキャンペーン」に賛成できると思いますか、思いませんか。

(それぞれひとつずつ)

	全く そう 思わ ない	←	←	ど ち ら と も 言 え な い	→	→	と て も そ う 思 う
	1	2	3	4	5	6	7
野生動物の保全という理由であれば賛成する	☐	☐	☐	☐	☐	☐	☐
人間の健康維持という理由であれば賛成する	☐	☐	☐	☐	☐	☐	☐
地域の住環境維持という理由であれば賛成する	☐	☐	☐	☐	☐	☐	☐
飼いネコの健康維持という理由であれば賛成する	☐	☐	☐	☐	☐	☐	☐

このページに入力したものを全てクリアする

戻る

次へ

一時保存をして中断

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(ファイル名 q14exp.htm)

- 回答内容により質問番号が飛ぶことがありますが、気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

ネコの飼育と管理に関する調査

\$indicator

Q15A

同じ質問を別の聞き方でお聞きします。以下では、「屋外にいるネコをなくすキャンペーン」を始めるための4つの理由のうち3つの理由を取り出しています。
3つの理由を比較して、キャンペーンを始める理由として、一番賛成できると思う理由（あるいは3つの理由の中で一番マシだと思う理由）と、一番賛成できないと思う理由をそれぞれ1つずつ選択して下さい。
同じような質問を、組み合わせを変えて4回行います。

(それぞれひとつずつ)

	一 番 賛 成 で き る	一 番 賛 成 で き な い
生物多様性の保全	☐	☐
人間の健康維持	☐	☐
地域の住環境維持	☐	☐

このページに入力したものを全てクリアする

戻る

次へ

一時保存をして中断

\$hidden
(ファイル名 q15a.htm)

- 回答内容により質問番号が飛ぶことがあります。気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

ネコの飼育と管理に関する調査

\$indicator

Q15B

同じ質問を別の聞き方でお聞きします。以下では、「屋外にいるネコをなくすキャンペーン」を始めるための4つの理由のうち3つの理由を取り出しています。
3つの理由を比較して、キャンペーンを始める理由として、一番賛成できると思う理由（あるいは3つの理由の中で一番マシだと思う理由）と、一番賛成できないと思う理由をそれぞれ1つずつ選択して下さい。
同じような質問を、組み合わせを変えて4回行います。

(それぞれひとつずつ)

	一番賛成できる	一番賛成できない
人間の健康維持	☐	☐
地域の住環境維持	☐	☐
飼いネコの健康維持	☐	☐

このページに入力したものを全てクリアする

戻る

次へ

一時保存をして中断

\$hidden
(ファイル名 q15b.htm)

- 回答内容により質問番号が飛ぶことがあります。気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)



ネコの飼育と管理に関する調査

\$indicator

Q15C

同じ質問を別の聞き方でお聞きします。以下では、「屋外にいるネコをなくすキャンペーン」を始めるための4つの理由のうち3つの理由を取り出しています。3つの理由を比較して、キャンペーンを始める理由として、一番賛成できると思う理由（あるいは3つの理由の中で一番マシだと思う理由）と、一番賛成できないと思う理由をそれぞれ1つずつ選択して下さい。同じような質問を、組み合わせを変えて4回行います。

(それぞれひとつずつ)

	一番賛成できる	一番賛成できない
地域の住環境維持	☐	☐

飼いネコ健康維持	☐	☐
生物多様性の保全	☐	☐

このページに入力したものを全てクリアする

戻る

次へ

一時保存をして中断

\$hidden
(ファイル名 q15c.htm)

- 回答内容により質問番号が飛ぶことがありますが、気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)



ネコの飼育と管理に関する調査

\$indicator

Q15D

同じ質問を別の聞き方でお聞きします。以下では、「屋外にいるネコをなくすキャンペーン」を始めるための4つの理由のうち3つの理由を取り出しています。3つの理由を比較して、キャンペーンを始める理由として、一番賛成できると思う理由（あるいは3つの理由の中で一番マシだと思う理由）と、一番賛成できないと思う理由をそれぞれ1つずつ選択して下さい。同じような質問を、組み合わせを変えて4回行います。

(それぞれひとつずつ)

	一番賛成できる	一番賛成できない
飼いネコ健康維持	☐	☐
生物多様性の保全	☐	☐
人間の健康維持	☐	☐

このページに入力したものを全てクリアする

戻る

次へ

一時保存をして中断

\$hidden
(ファイル名 q15d.htm)

- 回答内容により質問番号が飛ぶことがありますが、気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

ネコの飼育と管理に関する調査

\$indicator

Q16

仮に「屋外にいるネコをなくすキャンペーン」が実際に行われることになったとします。

しかし、キャンペーンを実施する予算がないため、NPO法人（営利を目的としない団体）を立ち上げ、市町村に代わりそこが募金を集めて、キャンペーンを実施することになったとします。

あなたはこのNPO法人にいくら募金すると思いますか。ただし、実際に募金することで、ご自分が使えるお金が減ることを念頭においてお考え下さい。

このキャンペーンはあなたがお住まいの市町村で行われ、キャンペーンの結果、あなたの市町村からは屋外にいるネコがいなくなるとします（おとなりの市町村から入ってくるネコはいないものとしてお考え下さい）。

(ひとつだけ)

- ☐ 0円（募金しない）
- ☐ 100円
- ☐ 300円
- ☐ 500円
- ☐ 1,000円
- ☐ 2,000円
- ☐ 3,000円
- ☐ 5,000円
- ☐ 7,000円
- ☐ 10,000円
- ☐ 20,000円
- ☐ 30,000円
- ☐ 50,000円
- ☐ 100,000円

このページに入力したものを全てクリアする

戻る

次へ

一時保存をして中断

\$hidden

(ファイル名 q16.htm)

- 回答内容により質問番号が飛ぶことがあります。気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

ネコの飼育と管理に関する調査

\$indicator

Q17

あなたは自然環境や動物に関わる以下の意見に同意しますか（そう思いますか）、同意しませんか（そう思いませんか）。

(それぞれひとつずつ)

全く そう 思わ ない	←	←	ど ち ら と も 言 え な い	→	→	と て も そ う 思 う
1	2	3	4	5	6	7

人間には自然環境を改変する権利がある	☐	☐	☐	☐	☐	☐	☐
人間は自然環境に悪影響を与えている	☐	☐	☐	☐	☐	☐	☐
人間が自然環境に与える悪影響は回復能力を超えている	☐	☐	☐	☐	☐	☐	☐
野生動物の存在は重要である	☐	☐	☐	☐	☐	☐	☐
絶滅しそうな野生動物を保護することは重要である	☐	☐	☐	☐	☐	☐	☐
野生動物は人間と同じ価値を有している	☐	☐	☐	☐	☐	☐	☐
野生動物はペットと同じ価値を有している	☐	☐	☐	☐	☐	☐	☐

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戻る

次へ

一時保存をして中断

\$hidden

(ファイル名 q17.htm)

- 回答内容により質問番号が飛ぶことがあります、気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)



ネコの飼育と管理に関する調査

\$indicator

本調査の後半では、鹿児島県の屋久島（場所は図を参照）において来年から導入が検討されている山岳地域における協力金についてお伺い致します。新しい制度の導入が急ぎよ決まりましたため、前半とはテーマが異なりますがご質問をさせて頂きます。

ネコの飼育と管理に関する調査

\$indicator

最後に皆様ご自身についてお伺い致します。

Q24

あなたのものごとの考え方全般に関する下記の項目について、どのように思いますか。 (それぞれひとつずつ)

	全く そう 思わ ない	←	←	ど ち ら と も 言 え な い	→	→	と て も そ う 思 う
	1	2	3	4	5	6	7
他人の意見に耳を傾ける方である	☐	☐	☐	☐	☐	☐	☐
他人の意見を参考に自分の意見を変える方である	☐	☐	☐	☐	☐	☐	☐
自分の意見が他人と異なる場合、気にする方である	☐	☐	☐	☐	☐	☐	☐
多数派の意見に同調する方である	☐	☐	☐	☐	☐	☐	☐

Q25

あなたのお住まいの都道府県を1つ選択して下さい。 (ひとつだけ)

Q26

あなたの性別について、お答えください。 (ひとつだけ)

- ☐ 男性
- ☐ 女性

Q27

あなたの年齢（年代）について、お答えください。 (ひとつだけ)

- ☐ 10代

- ☐ 20代
- ☐ 30代
- ☐ 40代
- ☐ 50代
- ☐ 60代
- ☐ 70代以上

Q28

あなたのご職業について、お答えください。

(ひとつだけ)

- ☐ 会社員
- ☐ 公務員
- ☐ 団体職員
- ☐ 自営業
- ☐ パート
- ☐ 主婦
- ☐ 年金生活
- ☐ 学生
- ☐ その他（具体的に：)

Q29

差し支えなければ、あなたの最終学歴をお答えください。（社会経済学的分析を行う上で必要になります）。

(ひとつだけ)

- ☐ 中学卒業
- ☐ 高校卒業
- ☐ 専門学校卒業
- ☐ 短期大学卒業
- ☐ 4年生大学卒業
- ☐ 大学院卒業

Q30

差し支えなければ、あなたの家庭のおよその年収を税込みでお聞かせ下さい（社会経済学的分析を行う上で必要になります）。

(ひとつだけ)

- | | |
|---------------------------------|-------------------------------------|
| ☐ 200万円以下 | ☐ 1,201-1,400万円 |
| ☐ 201-400万円 | ☐ 1,401-1,600万円 |

- ☐ 401-600万円
- ☐ 601-800万円
- ☐ 801-1,000万円
- ☐ 1,001-1,200万円
- ☐ 1,601-1,800万円
- ☐ 1,801-2,000万円
- ☐ 2,001万円以上

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戻る

送信

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(ファイル名 **q24.htm**)

- 回答内容により質問番号が飛ぶことがあります。気にせずにご回答ください。
- 回線の混雑などが原因で反応が遅くなることがあります。ご了承ください。
- ブラウザの戻るボタンで戻った場合、回答が正しく受け付けられない場合があります。その場合、再度アンケートを最初からやり直して下さい。

(調査NO.16-406-0547)

