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Thema:

A comparison of the Money Allocation and Rating Scale to measure support changes towards wildlife species by the general public

Results of an experimental and longitudinal research design structure in Valdivia, Chile

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Abstract

Nowadays, a challenge in wildlife management and nature conservation is to reach a state of human-wildlife coexistence, integrating wildlife into the human-dominated landscape. Achieving a state of coexistence is urgent as human-wildlife conflicts increase over time. Thus a "route guide" for researchers and conservation practitioners will be needed to identify if a human-wildlife interaction is heading towards conflict or coexistence, enabling them to conduct management activities, when possible, to achieve human-wildlife coexistence. Researchers have used different individual-based attributes as a proxy to measure support towards wildlife species by the general public. Different operationalizations from Environmental Economics and Environmental and Conservation Psychology research fields have been used to measure support. Examples of operationalization are the willingness-to-pay and Likert-type scale, or rating scale, from the first and second research fields. In the first, participants must indicate how much they would be willing to pay to protect a specific wildlife species population in a particular area and time. In the second, participants are asked to rate statements through, e.g., a five-point ordinal rating scale with opposite alternatives between, e.g., *strongly agree* and *strongly disagree*. In the human dimension of natural resources management research, variations of these methodologies have been used to measure support, not only for one wildlife species but for a set. For the willingness-to-pay variation, i.e., money allocation, participants must distribute a constant sum of money among a set of wildlife species. For the rating scale variation, each of the wildlife species in the set corresponds to a statement to be rated. The thesis aims to contrast these two variations, i.e., money allocation and rating scale, in their capacity to assess support changes towards a set of 12 native wildlife species from different taxa.

A survey was applied in 2018 (n: 368) and replicated in 2019 (n: 359) among urban dwellers who cohabit with the wildlife species set, in Valdivia, south of Chile. The surveys were applied before and after information disclosure and exposure in an experimental and longitudinal research design structure, respectively. As information disclosure, the threatened and endemic status of the wildlife species was presented to the participants. On the other hand, mass media coverage of a human-wildlife conflict involving one of the species included in study, the South American Sea Lion, was used for information exposure.

The results indicate that the money allocation method identified support changes among the wildlife species to a greater extent than the rating scale for both types of information (Chapters 2, 3, and 4). The money allocation in the experimental design structure grouped the wildlife species based on their threatened and endemic status, while the rating scale did not come with the same results (Chapter 3).

In the longitudinal design structure, the South American Sea Lion support decreased based on the average values of the money allocation and rating scale after the information exposure (Chapter 4). Differently, when the South American Sea Lion position support is compared with the other wildlife species, based on the money allocation, there was a descent, while the rating scale presented an ascent after the mass media coverage of the human-wildlife conflict (Chapter 4).

This difference between the results of the two methods, in both research design structures, can be explained to a certain extent due to their scaling technique characteristics. The money allocation is a comparative scale; therefore, the support given to one wildlife species will affect the possible support given to the other species. In contrast, the rating scale is a non-comparative scale, i.e., the support given to a wildlife species is independent of the support given to the other wildlife species in the

set. In the experimental research design structure (Chapters 2 and 3), to give or increase the support to a threatened or endemic wildlife species, a bill should be taken from another wildlife species, usually not threatened nor endemic. On the contrary, in the rating scale, there was no need to choose; the support could be increased for a wildlife species without decreasing the support for other wildlife species. In the longitudinal study design structure, the money allocation allows direct comparison between wildlife species from one year to another, while the rating scale does not. For the money allocation, the possible amount of support to be given to a wildlife species, i.e., 12 bills of 1,000 CLP each, did not vary from 2018 to 2019. For the rating scale, the values received among the wildlife species can vary within the rating scale from one year to another, misleading to incorrect interpretations.

The money allocation method can be suitable for monitoring human-wildlife interactions, i.e., to position and visualize support shifts. The money allocation could be used as an overview of human-wildlife interactions in a specific area, working as a first assessment.

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List of abbreviations

BF	Barrios Frog (*Insuetophrynus acarpicus*)
CGSP	Common garden spider (*Doliomalus spp.*)
CH	Coicoi Heron (*Ardea coicoi*)
CLP	Chilean pesos
CT	Chilean Toad (*Calyptocephalella gayi*)
CVM	Contingent valuation method
CW	Chiloe Wigeon (*Mareca sibilatrix*)
CYO	Coypo (*Myocastor coypus*)
EM	Endemic status
FWCF	Freshwater Crayfish (*Varilastacus araucanis*)
FWF	Freshwater Fish (*Cheirodon spp.*)
FWPC	Freshwater Pancora Crab (*Aegla manni*)
HWC	Human-wildlife conflict
HWC	Human-wildlife coexistence
HWC-event	Human-wildlife conflict event
IUCN	International Union for Conservation of Nature
INE	"Instituto Nacional de Estadistica" (Statistic National Institute)
MA	Money allocation
MCRT	Many-colored Rush-tyrant (*Tachirus rubigstra*)
NGO	Non-gubernamental organization
SFG	Spot-flanked Gallinule (*Gallinula melanopis*)
RS	Rating scale

SASL	South American Sea Lion (*Otaria flavescens*)
TH	Threatened status
WTA	Willingness to accept
WTP	Willingness to pay
WWF	World Wide Fund

1. General introduction

1.1. Dissertation context in the human dimensions of natural resource management field

Nowadays, a challenge in wildlife management and nature conservation is to reach a state of human-wildlife coexistence, integrating wildlife into the human-dominated landscape (Linnell and Kaltenborn 2019). Achieving a state of coexistence is urgent as human-wildlife conflicts (HWC) increase over time (IUCN 2020b; Frank and Glikman 2019). Human-wildlife coexistence has been defined as "…*the ability of humans and wildlife to interact and through those interactions build a community that is integrated, and can cope with moderate and manageable competition*…" (Frank and Glikman 2019, p. 8). On the other hand, HWC occurs "…*when the needs and behavior of wildlife impact negatively the goals of humans or when the goals of humans negatively impact the needs of wildlife"* (Madden 2004, p. 248). Under the scenario that by 2030 the urban extension will triple compared to 2000 (Seto et al. 2012), and large mammals populations are recovering worldwide, Europe included (Deinet et al. 2013), human-wildlife interactions are and will continue to increase, giving place to more conflict situations (Schell et al. 2021). The research field's response has been to engage human-wildlife interactions. Multidisciplinary applied research fields from the social science as human dimension of natural resources management (Bennett et al. 2017) have emerged to understand and tackle HWC. For example, in Europe, including Germany, since the return of the European Wolf *(Canis lupus spp.),* there has been an increase in research and strategies to integrate this species into the landscape (Fechter and Storch 2014; Plaschke et al. 2021), measure the attitudes and knowledge towards this species (Arbieu et al. 2019; Randler et al. 2020; NABU 2022), conducting awareness strategies among the population (NABU 2022), and providing governmental subsidies to stakeholders affected by the presence of Wolves packs (Dokumentations- und Beratungsstelle des Bundes zum Thema Wolf 2022).

In pursuing human-wildlife coexistence, a "route guide" will be helpful, e.g., for conservation practitioners and decision-makers, to indicate the state of specific human-wildlife interactions, i.e., how relative close or away they are from conflict or coexistence within the conflict-to-coexistence continuum (Frank and Glikman 2019). It has been described that attitudes or preferences towards wildlife species can shift from negative to positive, or vice versa, within the conflict-to-coexistence continuum (Frank et al. 2019). Furthermore, once the position of a specific human-wildlife interaction is derived over time, it could be possible to assess a trend, i.e., if the human-wildlife interaction is heading towards conflict or coexistence. Developing this type of monitoring, not only for ongoing conflicts but also for potentially conflictive interactions, could translate into the following advantages:

- Manage human-wildlife interactions before they become a conflict. In general terms, human-wildlife interactions are identified when they have already reached a "boiling point" or passed an "inflection point". Once a human-wildlife interaction has become a conflict, managing them to transform them into coexistence is complex and highly resource-consuming compared to preventing them (Frank et al. 2019; Woodroffe et al. 2005).
- To identify underlying HWC. Nowadays, human-wildlife interactions are generally managed in areas where conflicts occur, typically in the countryside. Even so, as we are in the "Information Era", it has been suggested that media news about an HWC could have an impact on the attitudes of dwellers located far away from the events (Arbieu et al. 2019). News media also could constitute a misinformation source about wildlife species for the general public (Fernández-Gil et al. 2016). Therefore, the collateral effects of an HWC can be far beyond where they occur. It would be

necessary to include these effects in the HWC management equation to approach an integral human-wildlife coexistence.

A possibility to assess the state of a human-wildlife interaction and identify its oscillation between conflict and coexistence over time would be to derive a specific value of specific human-wildlife interactions, indicating how relatively close or away they are from conflict or coexistence and vice-versa.

1.2. Valuing human-wildlife interactions

The complexity of human-wildlife interactions, including conflicts, has been studied for decades (Newing 2010; Frank et al. 2019; Kellert 1996). One study line focused on identifying and classifying different attributes involved in human-wildlife interactions (Karanth and Vanamamalai 2020; Lischka et al. 2018; Marchini et al. 2019). One group of attributes are those located at an individual level (Lischka et al. 2018; Bennett et al. 2017). Some individual-based attributes are; knowledge about, support, and attitudes toward wildlife species (Liordos et al. 2020; Liordos et al. 2017b; Kansky et al. 2016; Tisdell 2006; Tisdell et al. 2007; Tisdell and Wilson 2004, 2006; Tisdell et al. 2005, 2006; Wilson and Tisdell 2005; Denninger Snyder and Rentsch 2020). Based on the research field, these attributes have been operationalized to obtain a quantitative value aiming to derive a specific value for a particular human-wildlife interaction, e.g., between a wolf pack and urban and rural dwellers in a limited geographical range.

Some researchers have used the attribute of support towards wildlife species by the general public as a proxy of an overall measurement of human-wildlife interactions (DeKay and

McClelland 1996; Gunnthorsdottir 2001; Meuser et al. 2009; Samples et al. 1986; Tisdell and Wilson 2004, 2006; Nilsson et al. 2020; Mykrä et al. 2017; Teixeira et al. 2021; Randler et al. 2020). Using a single attribute as a general measure for a human-wildlife interaction could be considered too reductionist; even so, it could have its grounds in the following. Researchers, primarily in the Environmental and Conservation Psychology field [for an overview of the research field, please refer to Bennett et al. (2017)], have found a statistically significant relationship between the support towards wildlife species and other individual-based attributes in different socio-ecological contexts, with the same results. Some of these attributes are; knowledge about (Tisdell and Wilson 2004, 2006), likeability (Liordos et al. 2020), and different types of attitudes towards wildlife species (Liordos et al. 2017a; Knight 2008; Kellert 1996; Manfredo et al. 2009). Furthermore, concerning the attribute of knowledge about wildlife species, researchers from Environmental Economics [for an overview of the research field, please refer to Bennett et al. (2017)] have identified support changes after providing the participants with information about the wildlife species (Arbieu et al. 2019; Ballejo et al. 2021; Houston et al. 2010; Majić et al. 2011; Treves et al. 2013; Samples et al. 1986; Tkac 1998; Tisdell 2006; Tisdell and Wilson 2004, 2006; Tisdell et al. 2007).

Based on the above, the attribute of support towards wildlife species may function as an overall assessment to represent the state of a human-wildlife interaction. Subsequently, with this initial evaluation, if a conflict or potential conflict is detected, a qualitative methodology to have a deep understanding of the situation could be applied, aiming to resolve it.

1.3. Support towards wildlife species by the general public

The verb support has been defined as "*to agree with and give encouragement to someone or something because you want him, her or it to succeed*" (Cambridge University 2022). The support towards someone or something can be classified within the social science disciplines and humanities as an individual attribute together with values, beliefs, knowledge, and motivations, among others (Bennett et al. 2017). Currently, there is no clear definition for a multidisciplinary understanding of the term "support" towards wildlife species which could be used in the applied conservation social science of human dimension of natural resources management (Bennett et al. 2017). Furthermore, there is little consistency in the conceptualization and measurement of the attributes used to compare acceptance levels or individual preferences toward a wildlife species population (Treves et al. 2013; George et al. 2016).

The operationalization of the support attribute towards wildlife species using a quantitative method for its measurement has been developed mainly in two classic conservation social science fields (Bennett et al. 2017);

- In Environmental Economics, the support towards wildlife species populations has been operationalized in monetary terms through nonmarket valuations techniques, elicited as behavior or individual preferences (Atkinson et al. 2018; Champ et al. 2017).
- In Conservation Psychology, the support towards wildlife species has been generally operationalized as an attitude through a rating scale (Coolican 2014; Newing 2010; Whitehouse-Tedd et al. 2020).

As the human dimension of natural resources management is a multidisciplinary field, it becomes necessary to have a common understanding of a support concept for wildlife species. In that sense, independently of the operationalization and its research field inception, the following definition of the support towards wildlife species is proposed; "…*preferences or attitudes that directly or indirectly reflect a person's desire for a wildlife species population to maintain or increase over time in a specific area*…".

1.4. Money allocation and rating scale to assess support towards wildlife species

The money allocation method aims to derive behaviors or individual preferences as a proxy of support for wildlife species. In this method, also known as "constant sum" (Malhotra et al. 2017), participants have to allocate a fixed amount of money (e.g., 1000 Euro) among a set of wildlife species (DeKay and McClelland 1996; Gunnthorsdottir 2001; Meuser et al. 2009; Samples et al. 1986; Tisdell and Wilson 2004, 2006). Therefore, the higher the amount of money allocated to a wildlife species, the higher the support, and vice-versa.

The rating scale, specifically the Likert-type scale, also known as the summated rating technique (Coolican 2014; Likert 1932; Malhotra et al. 2017), is one of the most used methods in the human dimension of natural resources management research field (Bennett et al. 2017; Whitehouse-Tedd et al. 2020). The Likert-type scale is used to elicit the support for a wildlife species by rating different statements through a, e.g., five-point ordinal rating scale with opposite alternatives (Malhotra et al. 2017; Coolican 2014; Likert 1932). Usually, three or more statements are rated to represent an attitude toward one wildlife species

population (Hermann et al. 2013). For example, van Eeden et al. (2021) used 12 statements to measure participants' attitudes toward wolf conservation. After analyzing the 12 statements, the authors derived one dependent variable. Similar, but still different, some authors have used a variation of the Likert-type scale to measure support, likeability, or desirability of an encounter, for a set of wildlife species through one question (Liordos et al. 2020; Liordos et al. 2017a; Knight 2008). In this variation, a wildlife species set is defined, and each species correspond to a "statement". Participants rate the species one by one using the same rating scale as in the Likert-type scale, e.g., "…*How strongly do you support or oppose governmental protection of this animal…*".

According to the research field, the elicitation of support towards wildlife species has traditionally been used to fulfill a precise goal. In the Environmental Economics research field, the elicitation of support towards a specific wildlife species population has been conducted to develop a cost and benefit analysis (Atkinson et al. 2018). In the Environmental and Conservation Psychology research field, the support for wildlife species is usually used to correlate several attributes. In general terms, the elicitation of support towards wildlife species has not been used as a measure of its own, e.g., to assess support trends towards wildlife species populations in a specific area. A necessary step to accomplish the before mentioned, would be to contrast these two operationalizations, i.e., money allocation and rating scale, in their capacity to, e.g., identify differences in wildlife species support or support trends over time.

In the present dissertation, these two operationalizations were contrasted in their capacity to assess support changes after information disclosure and exposure in two research design structures; experimental and longitudinal. Information was selected to evaluate support

changes in both research design structures, as it has been identified as one main support driver for wildlife species (Arbieu et al. 2019; Ballejo et al. 2021; Houston et al. 2010; Majić et al. 2011; Treves et al. 2013; Samples et al. 1986; Tkac 1998; Tisdell 2006; Tisdell and Wilson 2004, 2006; Tisdell et al. 2007).

1.5. Aim of the dissertation

The dissertation aimed to contrast two operationalization of support for wildlife species in the human dimension of natural resources management field (Bennett et al. 2017). Specifically, the money allocation and rating scale methods were contrasted in their capacity to assess support changes among 12 native wildlife species in an experimental and longitudinal research design structure.

1.6. Objectives

1. Asses support changes towards wildlife species under information disclosure through the money allocation method.
2. Compare the money allocation and rating scale methods to assess support changes towards wildlife species after information disclosure; i.e. providing ecological traits of the wildlife species.
3. Compare the money allocation and rating scale method to assess support changes towards wildlife species after information exposure; i.e. mass media coverage of a HWC-event.

1.7. Structure of the dissertation

The present dissertation is structured into five chapters; the first corresponds to an introduction to the dissertation. Chapters two, three, and four directly answer the objectives proposed in section 1.6. Chapter five summarizes the results with the main conclusion, outlook, and research guidelines. Table 1 (below) provides an overview of the aim and relevance of the study in the human dimension of natural resource management for chapters two, three, and four.

Additionally, the present dissertation is organized so that each chapter (2,3, and 4) can be read independently. Due to this last, specific repetitions could be expected when reading the whole dissertation.

Table 1 Aim, the relevance of the dissertation chapter for each objective and chapter.

Obj.	Aim	Relevance of the dissertation chapter in "Human dimension of natural resources management" research field	Chapter nº
1	To assess the capacity of the money allocation method to elicit support and support changes after information disclosure towards non-charismatic wildlife species such as amphibians, fish, and invertebrates (Figure 1, letter a). The updated threatened and endemic status of the wildlife species was used as information. In addition, it was investigated if these two statuses could represent a difference in raising support.	Previous research with the same objective did not consider a control group in their experimental research design (Samples et al. 1986; Tkac 1998). On the other hand, studies that considered a control group were conducted among university students who did not cohabit with the wildlife species (Tisdell et al. 2005, 2006; Tisdell et al. 2007; Tisdell and Wilson 2004, 2006). This dissertation chapter is the first study assessing the effect of information disclosure among urban dwellers who cohabit with the wildlife species by using information on their current threatened and endemic status.	2
2	To compare the money allocation and rating scale method in their capacity to elicit support among wildlife species by the general public. Additionally, these two methods were contrasted to assess support changes after disclosing the threatened and endemic status of the wildlife species.	This dissertation chapter is the first research comparing the money allocation and rating scale method in their capacity to assess support changes among the general public using an experimental research design setting.	3
3	To compare the money allocation and rating scale method in their capacity to assess support changes towards a South American Sea Lion population after information exposure, i.e., news media coverage of an HWC-event.	This dissertation chapter is the first research to assess support toward a specific wildlife species population, i.e., South American Sea Lion, before and after a news media coverage of an HWC-event involving this wildlife species in a longitudinal research study design.	4

1.8. Methodological approach

The present dissertation can be placed in the "human dimension of natural resources management," which correspond to an applied research field in conservation social sciences (Bennett et al. 2017). In general terms, the human dimension of natural resources management research uses interdisciplinary approaches mixing methodologies from the social sciences to understand human-wildlife interaction. Here we used quantitative methods to measure support towards a set of wildlife species by the general public; money allocation and rating scale, from two classic conservation social science fields; Ecological Economics and Environmental Psychology, respectively (Bennett et al. 2017). Additionally, other variables were elicited, i.e., aesthetic and negativistic attitudes, knowledge about the threatened and endemic status, and general knowledge about the species.

Following a general methodology is presented, which is transversal for all following chapters. For insides of specific parts of the methodology, please refer to each chapter.

1.8.1. Study area

The study area is located in the city of Valdivia, approximately 900 kilometers south of the capital of Chile, Santiago. Valdivia is the capital of "Los Ríos" Region; this last is one of Chile's 16 administrative divisions. Additionally, the city of Valdivia is located in the commune, i.e., the smallest administrative subdivision in Chile, of the same name. According to the last national census, the commune of Valdivia is 166,080 inhabitants (INE 2017). The male and female proportions correspond to 48.38 % and 51.62 %, respectively, and the population's average age is 36.5 years (INE 2017). The main economic activities in "Los

Rios" Region correspond to agriculture, livestock, forestry, and fishing companies (BCN 2021).

The city of Valdivia is immersed in the Biodiversity Hotspot "*Chilean Winter Rainfall and Valdivian Forest*" (Mittermeier et al. 2011), surrounded by a web of wetlands composed of rivers and streams. Within this wetland web, it is possible to find a high diversity of native wildlife species, such as mammals and birds (Muñoz Pedreros and Quintana 2010), together with freshwater fishes, amphibians, and invertebrates (Muñoz-Pedreros 2003).

1.8.2.Survey design

To answer the proposd objectives (section 1.6), a quantitative questionnaire was developed and applied through a face-to-face interview among urban dwellers from the city of Valdivia. A survey was conducted in 2018 and later replicated in 2019 (Figure 1). To achieve objectives 1 and 2, a cross-sectional study with an experimental research design structure (Newing 2010) was developed (Figure 1, letters a and b). On it, the threatened and endemic status was disclosed to the participants (information disclosure). For 3, a longitudinal study design (Newing 2010) was chosen (Figure 1, letter c). The support was elicited before and after the news media coverage of an HWC-event (information exposure) involving one of the study's wildlife species, the South American Sea Lion (*Otaria byronia*). Please refer to each chapter for detailed specifications of the research design structure.

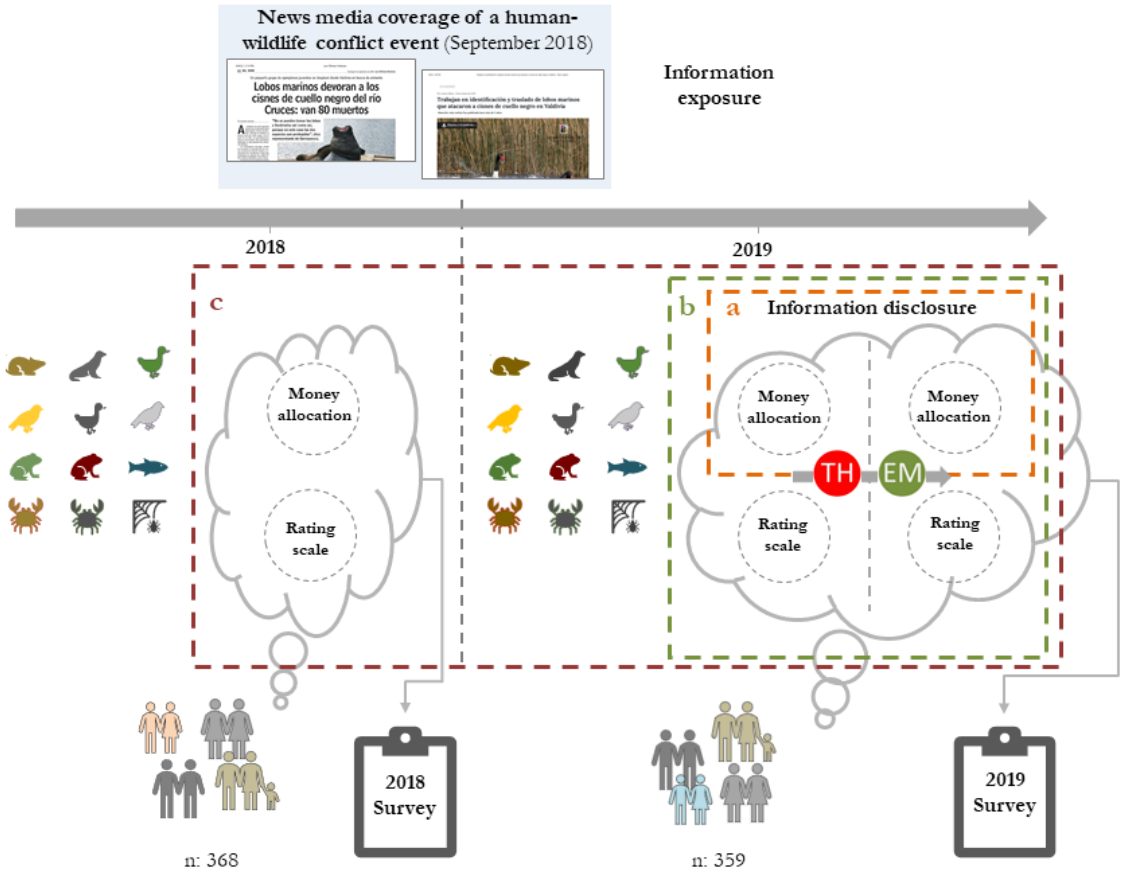

Figure 1 Research design structure of the dissertation. The support towards wildlife species was assessed among urban dwellers in two research design structures; experimental (a and b), providing information about the threatened (TH) and endemic (EM) status, and longitudinal after information exposure of news media coverage of a human-wildlife conflict event.

1.8.3.Support measurements and other variables

According to the proposed objectives, the support was measured through the money allocation and rating scale methods. For the money allocation, 12 simulated banknotes were given to participants (each banknote with a value of 1,000 Chilean pesos) and requested to be distributed among 12 wildlife species (Gunnthorsdottir 2001; Meuser et al. 2009; Samples et al. 1986; Tisdell and Wilson 2004; Malhotra et al. 2017). Choosing 12 banknotes and 12 wildlife species allowed the participant to support all wildlife species equally. It was mentioned to the participants that the money would be used to develop activities to protect/conserve the selected wildlife species; therefore, a higher amount of money would mean more activities, thus a higher chance to protect/conserve a wildlife species population. For the rating scale, the participants were asked, "…How strongly do you support or oppose governmental protection of each animal?..." (Knight 2008; Liordos et al. 2020; Liordos et al. 2017b). The answers were measured using a five-point ordinal rating scale, ranging from strongly opposing (- 2) to strongly supporting (+2).

Additionally, other attributes were elicited from the participants, fulfilling specific objectives of the chapters beyond the scope of the present dissertation objectives (section 1.6). In chapter number two and four, the participant's aesthetic and negativistic attitudes were elicited [for an overview of the concepts, please refer to Kellert and Wilson (1995) or Kellert (1996), or refer to the chapters]. Additionally, for chapter two, the knowledge of the threatened and endemic status and the general knowledge of the wildlife species were elicited.

1.8.4.Wildlife species

A set of twelve native wildlife species from the study area were selected. The wildlife species have current distribution in the study area and all of their ecological traits, i.e., threatened and endemic status, were updated before the first survey was conducted (2018). A list of the wildlife species and their threatened and endemic status, can be found in Table 2, chapter 2.

1.8.5.Data analysis

The data obtained for the support derived through the money allocation and rating scale for both surveys, 2018 and 2019, did not meet parametric assumptions for normal distribution (Field 2017). Additionally, it was not possible to conduct a transformation of the data; therefore, robust methods of analysis were chosen (Field 2017). Non-parametric statistical tests were used as the Spearman´s correlation coefficient, Wilcoxon signed-ranked test, Kruskal-Wallis plus a post hoc test, Friedman's ANOVA plus post hoc test, Sign Test, and a Mann-Whitney U-test (Field 2017). Please refer to each chapter under statistical analysis for specific statistical analysis tests.

2. Effect and difference between the threatened and endemic status on the general public support towards wildlife species in a biodiversity hotspot[1]

1 This Chapter, with some minor differences, has been published as an original research paper under the following reference: Espinosa-Molina, M., Rodriguez-Jorquera, I. A., & Beckmann, V. (2021). Effect and difference between the threatened and endemic status on the general public support towards wildlife species in a biodiversity hotspot. *Biodiversity and Conservation*, *30*(11), 3219-3241.

2.1. Abstract

General public inclusion in nature conservation is crucial to accomplish wildlife species recovery. Mammal and bird species usually receive most of the research and general public attention, leaving aside other taxa species. It is necessary to obtain general public support towards other taxa species by emphasizing ecological attributes. Here we test if disclosing the threatened and endemic status of amphibians, fish, and invertebrates could increase general public support. Additionally, we wanted to identify if the threatened and endemic status could implicate a difference in support. Interviews (N: 359) were conducted among the general public in Valdivia, Chile, to elicit the support, allocation of a fictional fixed amount of conservation funds (money allocation) towards native wildlife species. The species were two mammals and four bird species, none threatened nor endemic, and two amphibians, one fish, and three invertebrates, all threatened and endemic. The money allocation was derived on two occasions for each participant. Firstly, presenting colorful pictures with the name of the species and, secondly, adding the threatened and endemic status in two separate treatments. Results indicated mammal and bird species with significantly higher money allocation when pictures and names were provided. The main driver was a misperception of the threatened status of these species. When the threatened and endemic status was disclosed, the money allocation significantly shifted towards the amphibians, fish, and invertebrates. No difference in the money allocation was spotted between the threatened or endemic status. Our results indicate that participants associate charismatic species (mammals and birds) with threatened status. We encourage nature conservation entities to promote a broader spectrum of wildlife species by emphasizing conservation needs.

2.2. Introduction

Large-sized vertebrates species, like mammals and birds, have been the focus of research studies over non-mammalian and bird species as reptiles, amphibians, fish, and invertebrates species (Donaldson et al. 2017), possibly owing to low public preferences for this last group of species (Jarić et al. 2019). Additionally, the general public tends to support mammal and bird species over other taxa (Albert et al. 2018; Colléony et al. 2017b; Kellert 1996; Knight 2008; Liordos et al. 2017a; Tisdell et al. 2006; Tisdell and Wilson 2006). As a result, mammal and bird species have been widely used in marketing and fundraising strategies developed by conservation NGOs (Albert et al. 2018), like the Giant Panda by the WWF and the polar bear by Green Peace U.S.A. Also, in consumer products, like U.S.A. conservation and nature magazines; mammal and bird species usually are on their front covers (Clucas et al. 2008).

Aesthetic and negativistic attitudes of the general public could explain, to some extent, non-mammalian and bird species being ignored in research and general public attention. Aesthetic and negativistic attitudes have been described as the physical appeal and beauty of wildlife and as fear, aversion, and alienation from wildlife, respectively (Kellert 1996). Liordos et al. (2017a) and Knight (2008) had quantified these concepts to predict the main drivers of support by the general public towards wildlife species. Their results revealed that mammal and bird species received a high aesthetic score and low negativistic value, the opposite for non-mammalian and bird species. Similarly, Albert et al. (2018) identified that the general public associated large-sized vertebrates with charismatic species, usually perceived with high aesthetic value (Knight 2008; Liordos et al. 2017a). A potential side effect is that non-mammalian and bird species remain anonymous to the general public.

The threatened status is an attribute generally used to increase general public support towards wildlife species. Information disclosure of wildlife species promotes an increase in support independently of the aesthetic or negativistic attitudes of the general public towards certain species (Tisdell 2006; Tisdell et al. 2007; Tisdell and Wilson 2004, 2006). Additionally, information disclosure induces an equal distribution of support, e.g., allocation of a fictional fixed amount of conservation funds, among species independent of their physical appearance (Tisdell and Wilson 2006). Specifically, the threatened status increases general public support towards wildlife species with a low aesthetic value (Tisdell et al. 2006; Tisdell et al. 2007; Tkac 1998). However, the endemic status of a species has not been empirically assessed as an ecological attribute that increases general public support or contrasted with the threatened status.

Nowadays, due to the increasing loss of human-nature interactions (Kellert 1996; Soga and Gaston 2016), different strategies to "reconnect" people with nature have been conducted. The usage of digital social media by environmental institutions has been a strategy to increase awareness and support of wildlife species among the general public (Jarić et al. 2019; Kidd et al. 2018). A local Chilean NGO, in Valdivia (South Chile), has been promoting native wildlife species through its social media platforms. Their species selection criteria are mostly based on threatened or endemic status rather than charisma. As the endemic rate of wildlife species in Chile is globally one of the highest (Mittermeier et al. 2011), we considered the study area appropriate to identify if the disclosure of the threatened and endemic status of wildlife species could raise support differences by the general public. Consequently, a higher promotion of reptiles, amphibians, fish, and invertebrates species, could be translated into pecuniary and non-pecuniary resources donated by the general public to promote conservation activities for these taxa species (Veríssimo et al. 2017).

Stated Preferences Techniques to value non-market goods, specifically Contingent Valuation Methods (CVM), have been used to elicit general public support towards wildlife species. CVM involves asking people how much they would be willing to pay or accept (WTP/WTA) for a specific wildlife species to increase or decrease in a certain time and area (Richardson and Loomis 2009; Tisdell and Wilson 2004). A variation of the WTP has been the allocation of a fixed amount of money/conservation fund, also coined as "fixed pie" or "constant-sum game", to be distributed among wildlife species or ecological species attributes (DeKay and McClelland 1996; Gunnthorsdottir 2001; Meuser et al. 2009; Samples et al. 1986; Tisdell and Wilson 2004, 2006; Tkac 1998). The "*constant sum game*", from now on referred as money allocation, has proven to be effective in identifying changes in support, e.g., money allocation, among wildlife species depending on an increase or correction of knowledge about the species (Tisdell et al. 2007; Tisdell and Wilson 2006).

Studies investigating the influence of information disclosure on the money allocation of wildlife species by the general public have been done through methods not recommended in developing countries (Tisdell 2006; Tisdell and Wilson 2004, 2006; Tisdell et al. 2005, 2006; Wilson and Tisdell 2005; Tisdell et al. 2007). These studies imply a longitudinal design (Newing 2010), capable of tracking changes over time. Researchers who have conducted these studies collected their data mainly in developed countries by mixing workshop attendance and post (Tisdell et al. 2006; Tisdell and Wilson 2004, 2006). The guidelines for developing Contingent Valuation Methods in developing countries, "*Applications of the contingent valuation method in developing countries"* (Alberini and Cooper 2000), recommend that these studies should be developed through face-to-face interviews. Likewise, Bandara and Tisdell (2005), justified face-to-face interviews in Sri Lanka, because telephone or post approaches could be biased towards certain socio-demographic groups of the study area.

Therefore we needed to adjust previous methodologies used to identify support changes towards wildlife species, after providing information, in a single face-to-face interview.

Our study differs from previous research that assessed the effect of information disclosure by providing support towards wildlife species through the money allocation method based on the following. The present study was conducted among the general public, from a major city, through an experimental design, i.e., with a control group. Previous studies that had considered a control group has been conducted among university students using wildlife species that do not cohabit with the interviewees (Samples et al. 1986; Tkac 1998). On the other hand, those conducted among the general public with wildlife species cohabitating with the participants and current threatened status had not considered a control group in the experimental design (Tisdell et al. 2005, 2006; Tisdell et al. 2007; Tisdell and Wilson 2004, 2006).

The present study has the following objectives:

- Assess if information disclosure of the threatened and endemic status of wildlife species perceived with a low aesthetic value could influence money allocation of the participant.
- Assess if a difference in money allocation could occur if the threatened or endemic status of the same wildlife species is disclosed to the participant.
- Assess how the drivers behave before and after the threatened, and endemic status is presented to the participants.
- Assess the survey administration method applied in terms of suitability and effectiveness.

2.3. Methodology

2.3.1.Study area

The study area corresponded to the City of Valdivia, located approximately 900 km south of Santiago, the capital of Chile. Valdivia has an area of 1016 km^2 and 166,080 inhabitants. The male and female proportion corresponds to 48.38% and 51.62%, respectively. The main economic activities, in descending order, correspond to retail, real estate, construction, transportation and communication, agriculture, and livestock—forestry activities.

The city of Valdivia is surrounded by a web of wetlands composed of rivers and streams. The National Forest Corporation has described approximately 172 wildlife vertebrates species in the wetland, with a high level of endemism and a high percentage of them in a threatened status, since Valdivia is located in one of the 36 Biodiversity Hotspots, "*Chilean Winter Rainfall and Valdivian Forest*" (Mittermeier et al. 2011).

2.3.2.Survey design

A quantitative questionnaire for conducting interviews was chosen to test the correlation and direction between variables. The questionnaire consisted of the following sections: (i) Influence of information disclosure on the money allocation, (ii) drivers of money allocation: aesthetic and negativistic attitudes; general and specific knowledge of the species, and (iii) socio-demographic characteristics. These sections are described below (An English translation of the questionnaire is provided as Supplementary material, Appendix 1).

2.3.3. Influence of information disclosure on the money allocation of wildlife species by the general public

The money allocation was assessed as the allocation of conservation funds, a fixed hypothetical amount of money to measure changes in support after disclosing ecological attributes of wildlife species through labels (Tisdell and Wilson 2004, 2006). Twelve simulated bills (each bill with a value of 1,000.000 CLP) were given to the participants. Additionally, it was told to the participants that all bills should be distributed among the species, and the money would be delivered to environmental organizations to conduct conservation activities for the selected species. Therefore, a high allocation of money for a species could be translated into more possibilities to maintain or increase that population. The money allocation was registered on two occasions for each participant: (i) first money allocation: presenting colorful pictures and their names, and afterward, (ii) second money allocation, disclosing ecological attributes of the wildlife species (Figure 2). Once the participant allocated the money among the species (I-$), it was registered by the interviewer. Later, the participants were randomly placed in one of the three treatments. One-third of the sample the threatened status was disclosed, the other third the endemic status, and the last third the taxonomic group of the wildlife species, this last as a control group. Finally, the participants were asked if, with the new information, they would like to reallocate the money among the species. The final amounts allocated were registered for each treatment (TH-$, EM-$, and TAXA-$, respectively).

The design allowed us to test the following hypotheses:

H1

Without information on the threatened and endemic status, mammal and bird species will receive a higher money allocation compared to non-mammalian and bird species

H2

After the disclosure of the threatened and endemic status, the money allocation will increase towards species in a threatened and endemic status

H3

It will make a difference in the money allocation for the same wildlife species whether the threatened or endemic status is disclosed.

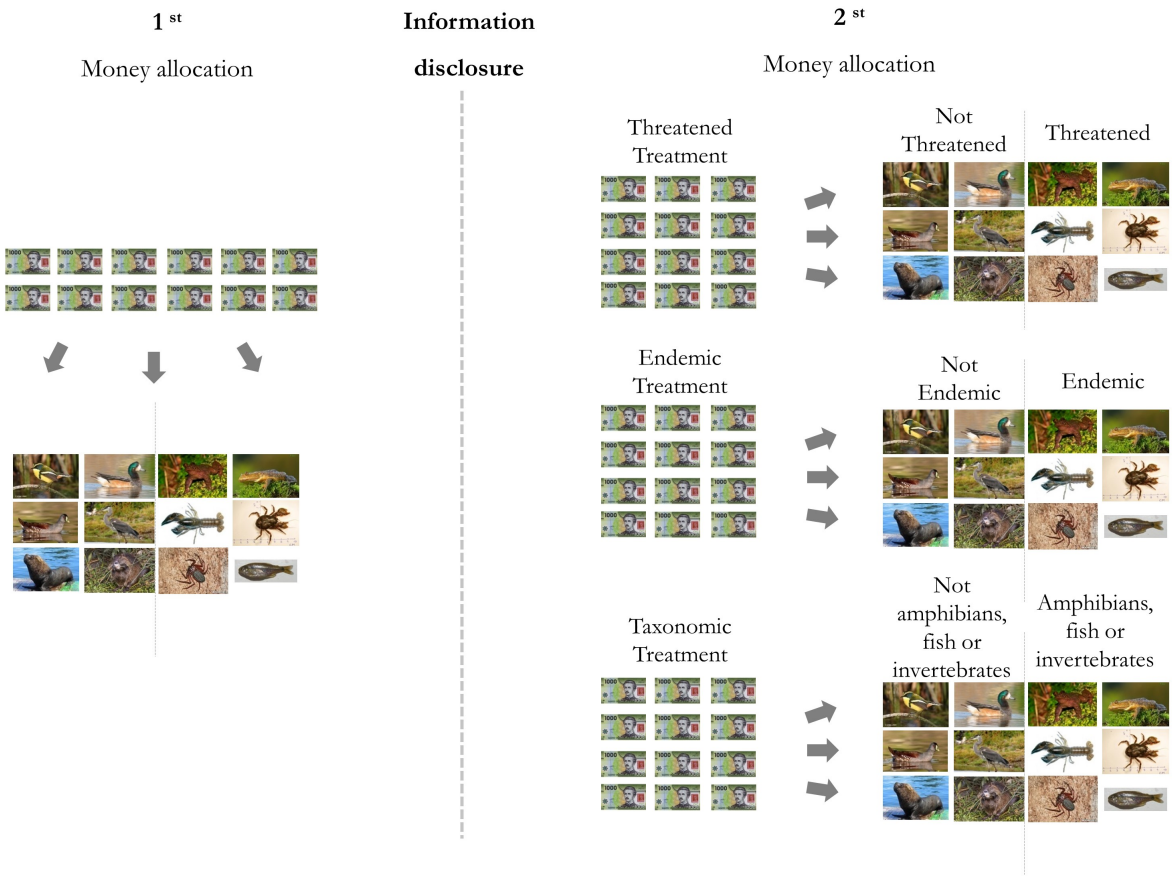

Figure 2 Research design structure for chapter two

2.3.4.Species selection criteria

The species to be included in the study had to satisfy two criteria. The first half should be mammal and bird species, which usually have public support due to their charisma (Albert et al. 2018), and the other half, not-mammalian and bird species, usually receiving less support from the general public (Knight 2008; Liordos et al. 2017a). This last half should be in a threatened and endemic status and the opposite for the mammal and bird species. To avoid confusion to the participants, if the species were in any of the IUCN threatened categories (critically endangered, endangered and vulnerable), they were told that the species was in a threatened status. Different sources to identify each species' threatened and endemic status were consulted, including the global IUCN Red List of Threatened Species (IUCN

2021) and the national inventory of wildlife species of Chile (Ministry of Environment). The species included were two mammals, four birds, two amphibians, one fish, and three invertebrates (Table 2).

Table 2 Wildlife species included in the study, including threatened and endemic status.

Species			*Status*	
Common Name	*Scientific Name*	*Taxonomic Group*	*Threatened* [a]	*Endemic* [b]
South American South Lion	*Otaria flavescens*	Mammal	Least Concern	Non-endemic
Coypu	*Myocastor Coypus*	Mammal		
Many-colored Rush-tyrant	*Tachuris rubrigastra*	Bird		
Spot-flanked Gallinule	*Gallinulla melanops*	Bird		
Coicoi Heron	*Ardea cocoi*	Bird		
Chiloe Wigeon	*Mareca sibilatrix*	Bird		
Barrio's Frog	*Insuetophrynus acarpicus*	Amphibian	Endangered	Endemic
Chilean Toad	*Calyptocephalella gayi*	Amphibian	Vulnerable	
Freshwater Crayfish	*Varilastacus araucanius*	Crustacean	Endangered Data Deficient	
Freshwater Pancora Crab	*Aegla manni*	Crustacean	Vulnerable	
Freshwater Fish	*Cheirodon spp.*	Osteichthyes (Fish)	Vulnerable	
Spider	*Doliomalus spp.*	Arthropods	No available information	

[a] *Threatened Status: According to IUCN red list of threatened species*

[b] *Endemic species: Species only occurring in Chile*

2.3.5.Drivers of money allocation

A set of independent variables was taken from similar studies to predict the general public's money allocation towards wildlife species. Authors have identified values to explain relation types or connections between human-kind and the natural world (Kellert 1996; Kellert and Wilson 1995). Some researchers have taken these values to predict the main drivers of support towards wildlife species, as aesthetic and negativistic attitudes (Knight 2008; Liordos et al. 2017a; Veríssimo et al. 2009). Aesthetic attitude (ATH) has been defined as focusing primarily on larger, more colorful, mobile, and diurnal species, e.g., mammals and birds (Kellert and Wilson 1995). Negativistic attitude (NEG) is related to hostility and negative feelings as aversion, fear, or dislike. Questions and wording were taken from Liordos et al. (2017a) to assess these attitudes. To measure ATH, participants were asked: "*could you please tell me what your initial reaction to each of the animals shown in the photographs is?"* and for NEG they were asked: "*how relaxed or afraid would you feel around each of the animals shown in the photographs in an encounter in the wilderness?"* The answers were measured by a Likert-like scale ranging from very ugly (− 2) to very attractive (2) and very relaxed (− 2) to very afraid (2), respectively. Additionally (before the treatments), the knowledge (perception) of the threatened and endemic status of each of the species was asked (KLDG-TH and KLDG-EM), as well as the general knowledge (KLDG-GNRL). Wilson and Tisdell (2005) assessed a higher money allocation towards species that were better known and common among the citizens of Brisbane, Australia. For threatened and endemic status, a brief definition was given of both concepts before the participant could answer. Afterward, each participant was asked: "*According to your knowledge or perception, could you please tell me which species is threatened/endemic?*" The answers were: (i) In a threatened / endemic status or ii. not. To measure the general knowledge of the species, participants were asked: "*Could you please tell me how much information*

you have of each species?" E.g. where does it live, what does eat, the size of the population? The answer was measured on a 5-point Likert-type scale ranging from very little information (− 2) to adequate information (2).

To assess socio-demographic characteristics, participants were asked to indicate their gender, age, education level, and monthly income (categories of each variable are presented in Appendix 1).

2.3.6.Sampling protocol

The sample units were citizens of Valdivia, as is recommended when the objective is to study attitudes between people and some natural environment components (Colléony et al. 2017b; Liordos et al. 2017a; Veríssimo et al. 2009). The minimum age to be included in the survey was sixteen years old. The questionnaire was pre-tested by the authors, to test the wording and the functionality of the materials. Face-to-face interviews were conducted with the citizens of Valdivia in public places. The survey was applied during March and April 2019, by three trained university students (interviewers), with the supervision of the first author. A simple random method was applied to obtain a representative sample of the population of Valdivia. Every fifth potential participant to be included in the data set was asked if they would be interested in participating in an interview with an average duration of 20 min. To increase the response rate, each person was told that after completing the questionnaire, a lottery ticket would be given for participation in a voucher of 50,000 CLP (approximately 55 €), to be used at a local grocery store. After receiving consent from the participant, ethical clearance was provided, explaining the study's context, purpose, and possible outcomes and ensuring their anonymity.

2.3.7. Analysis

Two groups of species were constituted to conduct the data analysis and test the stated hypothesis (except for the regressions), mammalian and bird species and non-mammalian and bird species (Table 2). The average values for each species group were calculated as the sum of the money allocation in each of the six species (I-$) divided by sample size (n: 359). To identify significant correlations or differences between (i) money allocation and the taxonomic group of the wildlife species (TAXA; mammal and bird species: 1, non-mammalian and bird species: 0), before and after disclosing ecological attributes; (ii) money allocation only providing colorful pictures and their names, and each treatment; and (iii) between the treatments, different statistical tests were conducted. For the first, a Spearman's correlation coefficient was performed between the variables I-$ and TAXA. For the second, a Wilcoxon signed-ranked test, and for the last, a Kruskal–Wallis test with a Dunn's post hoc test with a Bonferroni adjustment to assess differences within the treatments.

To predict the drivers of support towards the wildlife species, Binary Logistic Regressions were conducted. All the species assessed by each participant were included in the regression, not grouped by taxa. The variables assessed each time for each species were included as independent: ATH, NEG, KLDG-TH, KLDG-EM, KLDG-GNRL, and TAXA. The dependent variables, I-$, TH-$, EM-$, and TAXA-$, were significant to the Shapiro–Wilk test, been transformed into dichotomous variables: I-E$, TH-E$, EM-E$, and TAXA-E$, respectively. The variable I-E$ was included as an independent variable in the regressions for threatened status and endemic status treatment. In the case of the taxonomic group treatment, I-E$ was not included to avoid multicollinearity. The socio-demographic variables were left aside from the regressions since they fall away from the scope of our hypothesis.

From the regressions presented in Table 7, when the socio-demographic were included, for the above regression (before information disclosure), only age was a negative predictor, and for the treatments, only for the threatened status treatment, one variable was significant; gender being a negative predictor. The first interpretation would be that younger participants are willing to support a higher diversity of species than older participants. The second interpretation would be that female participants support a wider variety of wildlife species when the threatened status is disclosed. Therefore to maintain the focus of our hypothesis, the socio-demographic variables were not included in the results.

2.4. Results

2.4.1. Questionnaire response and socio-demographic characteristics

A total of 359 questionnaires were completed with 211 refusals, yielding a response rate of 59%. The sample size for the treatments, threatened status, endemic status, and taxonomic group were 138, 123, and 94, respectively. The socio-demographic characteristics of the sample are presented in Table 3. The gender proportion is constituted of 50.1% females and 47.9% males. The most common age range was 21–30 years (35.9%). The highest percentage of education corresponds to complete University or Technical degree (43.7%), and the highest percentage of monthly income is none (18.7%), probably due to the high percentage of students in the sample.

Table 3 Socio-demographic characteristics of the sample; chapter one (n: 359).

Characteristic	Frequency in the sample	Percentage (%)
Gender		
Female	180	50.1
Male	172	47.9
Other	0	0
Not answered*	7	1.9
Age		
16 – 20	19	5.3
21 – 30	129	35.9
31 – 40	72	20.1
41 – 50	66	18.4
51 – 60	48	13.4
61 – 70	20	5.6
71 – 80	0	0
81 or more	0	0
Not answered*	5	1.4
Education level		
Primary School (incomplete)	1	0.3
Primary School (complete)	0	0
High School (incomplete)	6	1.7
High School (complete)	68	18.9
University or Technical (incomplete)	113	31.5
University or Technical (complete)	157	43.7
Postgraduate (incomplete)	3	0.8
Postgraduate (complete)	4	1.1
Not answered*	7	1.9
Individual Monthly Income (CLP)		
None	67	18.7
Lower than 300,000	41	11.4
301,000 – 400,000	34	9.5
401,000 – 500,000	35	9.7
501,000 – 600,000	50	13.9
601,000 – 700,000	58	16.2
701,000 – 800,000	27	7.5
801,000 – 900,000	21	5.8
More than 901,000	20	5.6
Not answered*	6	1.7

**Incomplete or not answered*

2.4.2. Money allocation; presenting colorful pictures and names of the wildlife species

The overage money allocation presenting colorful pictures and the names of the wildlife species was 1,466.015 CLP for mammal and bird species and 531.657 CLP for the amphibians, fish, and invertebrates species (Table 4). The results of Spearman's rank correlation coefficient identify a positive correlation between the variables I-$ and TAXA ($r_s(4296) = 0.511$, $p < 0.001$). Additionally, based on the binary logistic regression (Table 7) the Odds Ratio of the variable TAXA indicates 4,697 more likely a mammal or bird species to be supported instead of an amphibian, fish, or invertebrate species.

Table 4 Descriptive statistics of the variables included in the study; chapter one.

Variable				*Range / Values*	*Taxa group species* [b]	*Mean*	*SD*	*Minimum Value*	*Maximum Value*
Abbreviation	*Description*								
I-$	Money allocation providing colorful pictures and names			0 – 12,000 CLP	MB	1,466.015	919.316	0	4,000
					N-MB	531.657	666.885	0	4,000
TH-$	Money allocation disclosing ecological attributes	Treatments	Threatened		MB	594.692	796.897	0	3,000
					N-MB	1,408.213	848.944	0	12,000
EM-$			Endemic		MB	596.206	786.305	0	3,000
					N-MB	1,398.374	785.622	0	4,000
TAXA-$			Taxa		MB	1,260.638	904.583	0	4,000
					N-MB	732.270	752.229	0	4,000
I-E$ [a]	Money allocation providing colorful pictures and names			0: Non-Support 1: Support	MB	.844	.363	0	1
					N-MB	.446	.497	0	1
TH-E$ [a]	Money allocation disclosing ecological attributes	Treatments	Threatened		MB	.411	.492	0	1
					N-MB	.859	.349	0	1
EM-E$ [a]			Endemic		MB	.424	.495	0	1
					N-MB	.859	.348	0	1
TAXA-E$ [a]			Taxa		MB	.777	.417	0	1
					N-MB	.571	.495	0	1
ATH	Aesthetic attitude			-2: Very ugly to 2: Very attractive	MB	.576	.948	-2	2
					N-MB	-.247	.937	-2	2
NEG	Negativistic attitude			-2: Very relaxed 2: Very afraid	MB	-.615	1.078	-2	2
					N-MB	-.465	.867	-2	2
KLDG-TH	Knowledge (perception) Threatened status			0: Not in a threatened / endemic status 1: In a threatened / endemic status	MB	.600	.490	0	1
					N-MB	.300	.458	0	1
KLDG-EM	Knowledge (perception) Endemic Status				MB	.508	.500	0	1
					N-MB	.392	.488	0	1
KLDG-GNRL	General knowledge of the species			-2: very little information to, +2: adequate information	MB	-.487	1.042	-2	2
					N-MB	-1.053	.836	-2	2
TAXA	Taxa group of the species			1: MB species 0: N-MB species	-	-	-	-	-

[a] *Converted as dummy variables from: I-$, TH-$, EM-$, TAXA-$*

[b] *MB: mammals and birds species; N-MB: non-mammal and bird species: amphibians, fish and invertebrates species.*

2.4.3. Influence of information disclosure on the money allocation wildlife species

For the threatened status and endemic status treatments, a negative correlation was found between the variables TAXA and, TH-$ and EM-$, $r_s(1657) = -0.466$, $p < 0.001$ and $r_s(1476) = -0.466$, $p < 0.001$, respectively. For the taxonomic group treatment, a positive correlation between the variables TAXA and TAXA-$ was spotted, $r_s(1128) = 0.302$, $p < 0.001$. These results indicate a shift of the money allocation towards amphibians, fish, and invertebrates species when the threatened and endemic status was disclosed. For the taxonomic group treatment (mentioning the taxa of each species) the money allocation did not shift, and the mammal and bird species still had a higher money allocation. Additionally, the Wilcoxon Ranked Test results identify significant differences between the variable I-$ and all treatments (Table 5).

Table 5 Wilcoxon signed rank test results.

Taxa group species [a]	*Initial money allocation*	*After information money allocation*	*Negative ranks*			*Positive ranks*			*Ties*	*Test*
		Treatments	*N*	*Mean rank*	*Sum of ranks*	*N*	*Mean Rank*	*Sum of ranks*	*n*	*Z*
MB	I-$	Threatened	470	251,89	118389,00	24	161,50	3876,00	335	-18.436[b] *
		Endemic	376	197,90	74411,00	15	148,33	2225,00	347	-16.509 [b] *
		Taxa	69	39,80	2746,50	8	32,06	256,50	487	-6.481[b] *
N-MB		Threatened	19	221,39	4206,50	529	276,41	146219,50	280	-19.757[c] *
		Endemic	18	158,22	2848,00	418	221,10	92418,00	302	-17.527 [c] *
		Taxa	10	25,00	250,00	72	43,79	3153,00	482	-6.933 [c] *

[a] *MB: mammals and birds species; N-MB: non-mammal and bird species: amphibians, fish and invertebrates species.*

[b] *Based on negative ranks.*

[c] *Based on positive ranks.*

* $p < 0.001$

2.4.4. Differences between the threatened and endemic status effect on the money allocation of wildlife species

The Kruskal–Wallis test shows a statistically significant difference in the money allocation between the treatments, both for mammal and bird species and amphibians, fish, and invertebrates species (Table 6). The pairwise comparison identified a statistically significant difference between the control group (taxonomic group) and both treatments, i.e., threatened and endemic status. Contrarily no statistically significant difference between the threatened and endemic treatment was spotted.

Table 6 Comparison between money allocation for two different wildlife species groups.

Taxa group species [a]	*Kruskal-Wallis test*	*Pairwise Comparisons of Treatments*					
		Treatments	*Test Statistic*	*Std. Error*	*Std. Test Statistic*	*Sig.*	*Adj. Sig.* [b]
MB	H (2) = 241.132, p < .001	Threatened-endemic	-4.931	28.762	-.171	.864	1.000
		Taxa-threatened	-435.672	31.030	-14.040	< .001	< .001
		Taxa-endemic	-430.741	31.778	-13.555	< .001	< .001
N-MB	H (2) = 283.390, p < .001	Threatened-endemic	4.828	29.275	.165	.869	1.000
		Taxa-threatened	480.325	31.573	15.213	< .001	< .001
		Taxa-endemic	475.496	32.343	14.702	< .001	< .001

[a] *MB: mammals and birds species; N-MB: non-mammal and bird species: amphibians, fish and invertebrates species.*

[b] *Significance values have been adjusted by the Bonferroni correction for multiple tests.*

2.4.5. Drivers of the money allocation before and after disclosing the threatened and endemic status of the wildlife species

Before disclosing the threatened and endemic status of the species, the money allocation had as statistically significant positive predictors the following variables: ATH, KLDG-TH, KLDG-EM, and TAXA. The variables NEG and KLDG-GNRL were negative predictors. After disclosing the threatened and endemic status, the significant positive predictors for both groups were: I-ES, ATH, and KLDG-EM, and negative predictors were KLDG-GNRL and TAXA. The significant positive predictors for the taxonomic group treatment were: ATH, KLDG-TH, KLDG-EM, and TAXA, and negative predictors were NEG and TAXA (Table 7).

Table 7 Binary logistic regression results.

Before information disclosing (N: 4231)				
Predictors [a]	*β coeff.*	*SE(β)*	Wald's X^{2b}	*Odds ratio*
ATH	,430	,045	90,659***	1,537
NEG	-,368	,044	69,261***	0,692
KLDG-TH	1,107	,085	168,399***	3,025
KLDG-EM	,495	,080	37,937***	1,640
KLDG-GNRL	-,108	,043	6.447**	0,897
TAXA	1,547	,092	282,268***	4,697
Constant	-,943	,065	1,574	,922
-2LL	5508.265 / 4188.678			
	X^2 = 1452.086, df = 6, p < 0.001			
Nagelkerte R2	,399			
Hosmer & Lemeshow test	,912			
Classification accuracy (%)	64,4 / 76,9			

	Threatened (N: 1646)				Endemic (N: 1441)				Taxa (N: 1123)			
	β coeff.	*SE(β)*	Wald's X^{2b}	*Odds ratio*	*β coeff.*	*SE(β)*	Wald's X^{2b}	*Odds ratio*	*β coeff.*	*SE(β)*	Wald's X^{2b}	*Odds ratio*
I-E$	1,810	,223	65,903***	6,111	2,258	,266	72,265***	9,564	-	-	-	-
ATH	,183	,083	4,908**	1,201	,196	,087	5,025**	1,216	,473	,084	31,524***	1,606
NEG	-,018	,074	,058	,982	-,001	,077	,000	0,999	-,254	,078	10,564**	,775
KLDG-TH	-,191	,138	1,911	,826	,292	,154	3,588	1,339	,974	,161	36,756***	2,648
KLDG-EM	,556	,130	18,361***	1,743	,549	,141	15,099***	1,731	,597	,150	15,857***	1,817
KLDG-GNRL	-,139	,063	4.919**	,871	-,149	,067	4.889**	0,862	-,122	,079	2,351	,885
TAXA	-3,463	,232	223,219***	,031	-3,841	,275	195,571***	0,021	,342	,167	4,203**	1,408
Constant	1,135	,145	61,039***	3,111	,848	,150	32,026***	2,336	-,238	,147	2,609	,788
-2LL	2159.468 / 1632.160				1877.605 / 1378.052				1419.228 / 1186.874			
	X^2 = 527.308, df = 7, p < 0.001				X^2 = 499.553, df = 7, p < 0.001				X^2 = 232.354 df = 6 p < 0.001			
Nagelkerte R2	,375				,402				,261			
Hosmer & Lemeshow test	,157				,450				,229			
Classification accuracy (%)	63,5 / 75,5				64,3 / 73,8				67,3 / 74,4			

[a] Definitions: I-ES: Initial Election to Support (0: Non-Support, 1: Support); ATH: Aesthetic attitude (-2: Very ugly to 2: Very attractive); NEG: Negativistic attitude (-2: Very safe to 2: Very afraid); KLDG-TH, Knowledge (perception) of threatened status of the species (0: Not in a threatened status, 1: In a threatened status); KLDG-ED, Knowledge (perception) of Endemic status of the species (0: Not in an Endemic Status, 1: In an Endemic Status); KLDG-GNRL, General information of the species (-2: very little information to, +2: adequate information); TAXA: A groups including mammals and birds (MB species) and other amphibians, fish and invertebrates species (N-MB species) (0: N-MB species, MB species: 1)

*[b] Significance: ** p < 0.05, ***p < 0.001*

2.5. Discussion

According to our hypotheses, three main results can be derived from the present study: Firstly, mammal and bird species received a higher money allocation than the amphibians, fish, and invertebrates species when only pictures and their names were presented, accepting H1. Secondly, after the provision of the threatened and endemic status of the species, there was a significant shift of the money allocation from mammal and bird species towards amphibians, fish, and invertebrates species, accepting H2. Thirdly, there was no difference if the participant was informed that a wildlife species is threatened or endemic to promote support among the general public, rejecting H3. Additionally, the method successfully tested the proposed hypothesis through a single face-to-face interview. The discussion section will be structured as follow. First, our results will be contrasted with previous findings; secondly, the method used will be commented.

2.5.1. Money allocation; presenting colorful pictures and names of the wildlife species

Mammal and bird species, overall, received a higher money allocation than the other taxa species included in the study when only colorful pictures and names were presented to the participants. All the variables included in the regression (Table 7) were either significant positive predictors: ATH, KLDG-T, KLDG-EM, KLDG-GNRL and TAXA, or significantly negative NEG. It has already been assessed that the general public intrinsically will support large-sized vertebrates, particularly mammal and bird species, over other taxa species (Albert et al. 2018; Liordos et al. 2017a). What stands out from the present study (not yet empirically reported) is the perceived threatened and endemic status and aesthetic value

as predictors of money allocation. From the sample, 60% of the participants perceived the mammal and bird species as threatened, and only 30% for the amphibians, fish, and invertebrates species (Table 4). On the contrary, according to the Red List Index (IUCN 2021b)non-mammalian and bird species need more conservation efforts, a situation also described for Chile (Ministerio de Medio Ambiente 2021). It is possible that the general public associate's mammal and bird species with the taxa with more conservation priorities, among others. If this is the case, it would be necessary to continue studying this phenomenon to develop corrective measures to overcome this situation.

2.5.2. Influence of information disclosure on the money allocation wildlife species

The results indicate that information disclosure, regardless of the type, significantly affects the money allocation for wildlife species perceived with low aesthetic value, such as amphibians, fish, and invertebrates species. However, the threatened and endemic status has a significant influence. For all treatments (i.e., threatened status, endemic status, and taxonomic group of the wildlife species), the money allocation shifted towards the amphibians, fish, and invertebrates species when the information was disclosed (Table 5). Similar results were obtained by Samples et al. (1986). He measured the information effect on the support towards a wildlife species among university students with a control group. The money allocation was significantly higher after information about the threatened species was disclosed. In the case of the threatened and endemic treatments, the variables behave similarly: positive predictors, IE-$, ATH, KLDG-EM, KLDG-GNRL, and negative TAXA. The variable IE-$ indicates when information was disclosed to the participants; in most cases, the reallocation of money among the species was not entirely different, leaving some money on the species selected before information disclosure. This last could also explain the positive significance of the variable ATH for both treatments. Despite non-mammals and bird species overall being perceived as ugly species (Table 4), and for the threatened status and endemic status treatments, non-mammals and bird species received overall a higher money allocation (Table 4). Still, the variable ATH was a positive predictor of support (Table 7). The variable KLDG-EM, as opposed to KLDG-TH, remained significant, possibly due to the common name of the two amphibians, "Chilean Toad" and "Mehuín Frog", easily assessed as endemic by the participants due to their common names representing localities in Chile. The primary purpose of the taxonomic group treatment (control group) was to identify the effect of

highlighting the amphibians, fish, and invertebrates species with specific ecological characteristics. In the experiment, it was assumed that indicating to which taxonomic group each species belongs would not be relevant information to reallocate the money by the participants. For this last treatment, the predictor variables behave similarly before information disclosure, except for KLDG-GNRL, not being significant (Table 7). To our knowledge, no studies have tested the effect of information disclosure on the money allocation of wildlife species by the general public in developing countries and South America. Our findings are congruent with the available literature on the topic, evidencing a shift in the money allocation among the species towards those with conservation priorities (Samples et al. 1986; Tkac 1998; Tisdell 2006; Tisdell and Wilson 2004, 2006; Tisdell et al. 2007). Additionally, our results suggest that the information type delivered can generate a higher or lower money allocation. In this case, the threatened and endemic status of the species produced a higher money allocation than mentioning the taxonomic group of each species (Samples et al. 1986; Tkac 1998; Tisdell and Wilson 2004, 2006).

2.5.3. Differences between the threatened and endemic status effect on the money allocation of wildlife species

Disclosing the threatened or endemic status of the same wildlife species to the participants does not imply a difference in the money allocation. Based on the fact that the study area is located in one of the 25 hotspots, characterized by a high number of endemic species (Mittermeier et al. 2011), we expected the general public could empathize with this ecological attribute to a greater extent than the threatened status. However, our results indicate the contrary (Table 4). The extent to which the general public empathizes or support wildlife species endemic status over other attributes could be context-dependent as different

researchers have found contrasting results. A study by Garnett et al. (2018b) indicates that the Australian public will support bird species conservation activities independently of their taxonomic distinctiveness. Conversely, some authors have identified that among a series of ecological attributes, including endemism status, this was prioritized among the survey participants (Shapiro et al. 2016; Veríssimo et al. 2009). The complexity of the information should be considered when the general public is asked to manage this specific type of information. For example, an assessment conducted among the citizens of Brisbane, Australia, estimated that few participants managed basic knowledge of ecological features of well-known mammal species (Tisdell et al. 2007; Tisdell and Wilson 2004, 2006). Furthermore, according to Courchamp et al. (2018) the number of correct answers given about the threatened status of the ten most cherished species was infrequent among science university students.

2.5.4.Methodological approach

The method used was an effective way to measure the effect of information disclosure on the support towards wildlife species through a single face-to-face interview in public areas, besides obtaining a representative sample of the citizens of a major city. Two main points will be discussed regarding the method used. First, comparing the results with similar studies but different experimental settings. Secondly, an interpretation of the relation between the perceived threatened status of the wildlife species and the money allocation.

Studies measuring the effect of information disclosure on the money allocation towards wildlife species can be categorized into two groups based on the validity of the research design (Newing 2010). One group being conducted among university students with a control group and wildlife species that do not cohabit with the interviewed, presenting a high

"internal validity". The other group, conducted among the general public with wildlife species that cohabit with them, without a control group, with a high "context validity". From the first group, Samples et al. (1986), included two experimental groups to identify differences in money allocation for the conservation of a whale species before and after a video of the species was presented. A control group was included, showing an unrelated whale video ("The Sixty Second Spot: The Making of a Television Commercial"). The results indicated an increase in support for both groups, but the control was lower than the group who saw the whale video. Similarly, Tkac (1998) used two groups of students from different university fields, economic and wildlife-related careers. A significant change in support was identified only for the economic group.

In the other research design context conducted among the general public by Tisdell and collaborators (Tisdell et al. 2007; Tisdell and Wilson 2004, 2006), the information disclosure effect among Brisbane citizens was assessed. The experiment included 24 wildlife species of different taxa with different conservation statuses. Overall, the results identified a change in the money allocation towards particular wildlife species after disclosing information. Still, the research design did not consider a control group.

Our experimental setting included a control group and was applied among the general public, providing "internal" and "context" validity to the results.

The results of mammals and bird species being perceived as threatened by the participants could be explained due to the social desirability bias (Coolican 2014; Newing 2010). Specifically in CVM, the social desirability bias generally is reflected in higher money allocation stated by the participants than they would genuinely give, compared to, e.g., self-

administered questionnaires (Leggett et al. 2003). In the present study, we used money allocation; therefore, the bias could not be translated into a higher or lower money allocation. Instead, a social desirability bias related to give correct answers regarding the threatened and endemic status of the species could have occurred. To illustrate this, and for simplicity, we will only refer to the threatened status. At the beginning of the interview, the participant was told that the money allocated to each species would be used to promote conservation activities to "…*increase or maintain the selected species population*…". It is likely that the participants have allocated the money to those species with a high aesthetic value, such as mammal and bird species (Knight 2008; Liordos et al. 2017a), or were driven by a resemblance pattern, i.e., phylogenetic closeness or principle of similarity to humans (Gunnthorsdottir 2001; Kellert 1996). Afterward, the threatened status of the species was asked, and it could be that the participants (and recalling the purpose of the interview) indicated those species as threatened based on their initial money allocation.

2.5.5. New research question and conservation and management implications

An unexpected result from the study, even a surprise, indicates that the general public wrongly perceives mammals and bird species with higher conservation needs, and the money allocation could be due to that misperception. If we leave aside the possible effect of the social desirability bias in our study, the following research question stands open: does the general public perceive mammals and birds more threatened than other taxa species? The correlation between general public support and mammal and bird species over other taxa has been empirically assessed (Albert et al. 2018; Gunnthorsdottir 2001; Knight 2008; Tisdell et al. 2006). But, to the best of our knowledge, the correlation between general public perceiving

mammal and bird species, comparatively, in a higher percentage of threatened status than other taxa species, is not.

Based on our results and considering that non-mammalian and bird species currently face the following situations: they are (i) at a higher extinction rate than mammals and bird species, (ii) are left aside from the general public by environmental institutions due to their low perceived charisma; thus the chances that the general public could know or manage basic information of it is unlikely, and (iii) due to their generally low aesthetic value, they will not be intrinsically supported by the general public. As community-based conservation is crucial to achieve natural resources management and conservation (Berkes 2004; Brooks et al. 2013; McKinley et al. 2017), the use of a broader range of taxa species by conservation practitioners might be a strategy to deliver an objective spectrum and state of all wildlife species to the general public (Bowen-Jones and Entwistle 2002; Entwistle 2000; Garnett et al. 2018; Tisdell et al. 2006; Troudet et al. 2017). For example, conservation practitioners could use species not based on their aesthetic value but relevant ecological attributes such as the threatened and endemic status (Brambilla et al. 2013).

3. Contrasting two methods, attitudinal and monetary, to assess support changes towards wildlife species by urban dwellers[2]

2 This Chapter, with some minor differences, has been published as an original research paper under the following reference: Espinosa-Molina, M., & Beckmann, V. (2022). Contrasting two methods, attitudinal and monetary, to assess support changes toward wildlife species by urban dwellers. *Conservation Science and Practice*, *4*(4), e12661.

3.1. Abstract

Monitoring the general public's support toward wildlife species is a strategy to identify if a specific human-wildlife conflict (HWC) is escalating or de-escalating over time. The support can change due to multiple factors, such as mass media news of HWC or providing information about ecological traits of a species. Methods such as the rating scale and the allocation of a fixed amount of money (money allocation) have been used in the human-wildlife dimension as a proxy to measure support toward wildlife species. We compared these two methods' capacity to assess the general public's support changes toward wildlife species in an experimental design setting. Face-to-face interviews were applied among urban dwellers (n: 359) in Valdivia, Chile. In each interview, the support toward 12 wildlife species was elicited using a rating scale and money allocation methods, on two occasions, before and after disclosing ecological traits of the species. The results indicate that the money allocation grouped the wildlife species based on shared ecological traits, information disclosed to the participants, while the rating scale did not obtain the same results. Specifically, the money allocation identified an increase and decrease of support toward the wildlife species, and the rating scale only an increment of support. These results could be partly explained due to the conceptual foundation of each method. The money allocation was designed to elicit preferences in a constrained choice, while the rating scale measures attitudes. As a constrained choice, the money allocation does allow maximum support to be given to one species only if all other species are left unsupported, while in the rating scale, it is possible to provide maximum support for all species. The mentioned characteristics of the money allocation make it more suitable than the rating scale when the objective is to identify support changes.

3.2. Introduction

The intergovernmental response for the sixth mass extinction of wildlife species (Ceballos et al. 2020) has been a public spend of USD50 billion per year (Bishop and Hill 2014). A percentage of this investment has been used to create and expand Protected Areas and large vertebrates' population's recovery strategies. Some of these strategies have been fruitful, and wildlife species populations are increasing in different regions worldwide (Deinet et al. 2013; Lees et al. 2021). Parallel, by 2030, the urban expansion will triple compared to 2000 (Seto et al. 2012). An increase in human-wildlife interactions could be expected under this scenario, probably raising human-wildlife conflict (HWC) situations (IUCN 2020a), if the interactions are not adequately managed and monitored (Soulsbury and White 2019). The HWC has been defined as occurring"…*when the needs and behavior of wildlife impact negatively on the goals of humans or when the goals of humans negatively impact the needs of wildlife"* (Madden 2004, p. 248). One of the most significant challenges of researchers and conservation practitioners nowadays is to turn current HWC into human-wildlife coexistence (Frank and Glikman 2019).

Several strategies will be needed to reach a state of human-wildlife coexistence. To this end, an instrument will be necessary to identify if a specific human-wildlife interaction trends toward conflict or coexistence. For example, it has been described that the attitudes or preferences toward wildlife species can shift from negative to positive, or vice versa, in a conflict-to-coexistence continuum. However, studies that have assessed human-wildlife interactions are usually conducted at one time-point using different methodologies, and long-term studies have been seldom to date (Dressel et al. 2015; Majić et al. 2011; Treves et al. 2013; Dietsch et al. 2019). Consequently, it is often difficult to assess if a specific HWC increase or decrease over time (Dressel et al. 2015). Having mentioned this, a practical

methodology to be replicated over time, which could identify support changes toward wildlife species by the general public in a specific socio-ecological context, will be helpful to assess how a human-wildlife interaction develops (IUCN 2020a). Furthermore, such a method could position and assess shifts of a specific human-wildlife interaction into this conflict-to-coexistence continuum.

The concept of support toward wildlife species can be defined by its measurement (Coolican 2014). This measurement has been developed in the human-wildlife dimension in two main research fields (Figure 3, section research field). One corresponds to Environmental Economics, and the other is Environmental and Conservation Psychology (for an overview of each research field, refer to Bennett et al. 2017). According to the field, authors have measured the support by eliciting two main attributes, individual preferences and attitudes (Figure 3, section attributes). In Environmental Economics, researchers have used methods to elicit the monetary value assigned by the participant to one or several wildlife species (Champ et al. 2017). These methods, e.g., contingent valuation methods and discrete choice experiments, are usually used to value nonmarket goods (Figure 3, section methods) (Atkinson et al. 2018). For example, in the contingent valuation methods, the participants are required to indicate how much they would be willing to pay or accept (WTP/WTA) to protect a specific wildlife population in an area and time (Richardson and Loomis 2009; Sorg and Loomis 1985; Martín-Lopez et al. 2008). Alternatively, some authors have used the "Allocation of a fixed amount of money" or money allocation to value several wildlife species through one question (Figure 3, dotted method A) (Samples et al. 1986; DeKay and McClelland 1996; Gunnthorsdottir 2001; Tisdell and Wilson 2004, 2006; Meuser et al. 2009; Espinosa-Molina and Beckmann 2022; Espinosa-Molina et al. 2021; Espinosa-Molina 2019). In this method, the participants are asked to allocate, e.g., USD 1,000, to a specific number

of wildlife species. Contrastingly, in Environmental and Conservation Psychology, researchers have measured the support toward wildlife species as an attitude through a Likert-type scale, also named summated ranking technique (Figure 3, section methods) (Coolican 2014; Whitehouse-Tedd et al. 2020). As the WTP, usually, this technique measures supports toward one species at a time. Participants have to rate statements or items through, e.g., a five-point ordinal rating scale, with opposite alternatives between "strongly disagree" to "strongly agree" (Likert 1932; Coolican 2014). For example, Hermann et al. (2013) measured the support toward the European bison (*Bison bonasus*) and Eurasian wolf (*Canis lupus*) using three statements to rate each species. A variation has been used to measure the support or likeability toward several wildlife species of different taxa in one question, Figure 3, dotted method B (Knight 2008; Liordos et al. 2017a; Liordos et al. 2020). In this variation, each wildlife species corresponds to a "statement", and participants need to rate the species using the same rating scale as in the Likert-type scale method. Afterward, the species are grouped based on the value received, e.g., conservation support, likeability, and desirability of encountering the species. While these two methods, money allocation and rating scale, have been used to measure the same attribute on certain occasions, i.e., support toward wildlife species, their differences have not been contrasted empirically, being the objective of this study. For a common understanding, independently of the research field and through which technique the support was measured, we propose the definition of support toward wildlife species as preferences or attitudes that directly or indirectly reflect a person's desire for a wildlife species population to maintain or increase over time in a specific area.

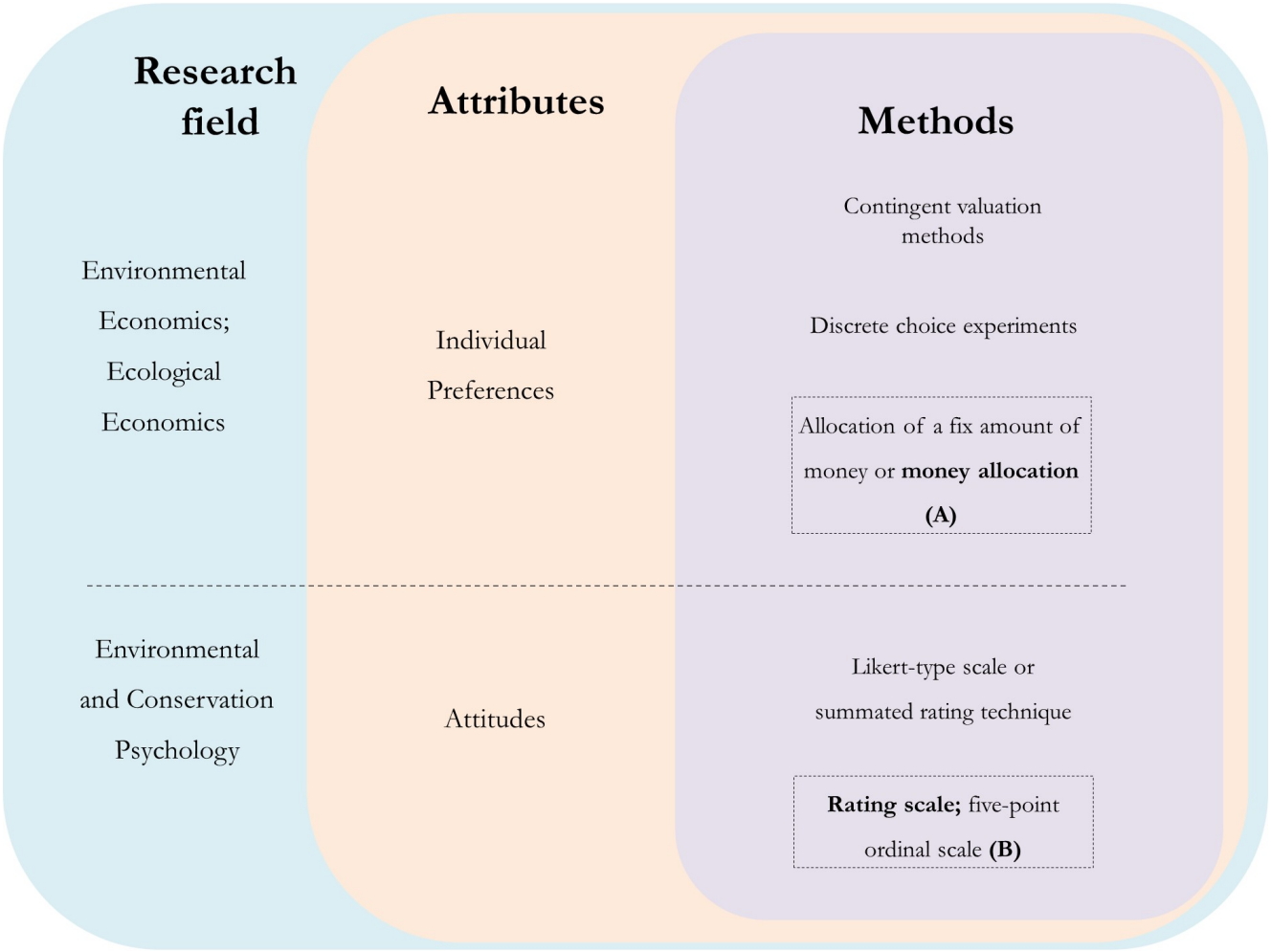

Figure 3 Methods compared to measure support towards wildlife species.

The support toward wildlife species by the general public can change due to multiple factors. For example, providing additional knowledge of the wildlife species, as ecological traits, can increase the support (Arbieu et al. 2019; Espinosa-Molina 2019; Espinosa-Molina et al. 2021). Conversely, HWC mass media coverage, casual encounters, and wildlife species impacting livestock are factors that could decrease the support (Arbieu et al. 2019; Ballejo et al. 2021; Houston et al. 2010; Majić et al. 2011; Treves et al. 2013). Therefore, a methodology aiming to measure support changes between specific wildlife species and the general public should identify the impact of the factors mentioned above on human-wildlife interactions.

Based on the evidence presented above, we wanted to contrast two widespread methods used to measure public support toward wildlife species, money allocation and rating scale. Additionally, we compared them under their capacity to assess support changes by disclosing wildlife species information. Specifically, we set the following research questions:

- What are the differences between money allocation and rating scale methods to elicit support toward wildlife species with urban dwellers, providing colorful pictures and common and scientific names?
- What are the differences between money allocation and rating scale methods to assess support changes toward the species when information is disclosed to the participant?

To our knowledge, this is the first research that compares two methods to elicit the support and its influence under information disclosure toward wildlife species by the general public in an experimental setting. Furthermore, to increase the external validity of our results, our sample is represented by urban dwellers addressed in public areas, selected by a random sampling method. Additionally, all the species included have current distribution in the study area, and their threatened and endemic status were updated before the data collection from official sources.

3.3. Methodology

The research presented here is part of a broader investigation. Other investigation results have already been published (Espinosa-Molina et al. 2021). References to this preceding publication will be given whenever appropriate.

3.3.1. Study area

The study was carried out in the city of Valdivia, south of Chile. Valdivia has a population of 166.080 inhabitants (INE 2017) and is located in the biodiversity hotspot "*Chilean Winter Rainfall and Valdivian Forest*" (Mittermeier et al. 2011). The city is surrounded by a wetland system formed by rivers such as the "Calle-Calle" and the "Cruces."

3.3.2.Survey design

To answer the proposed research questions, a survey was developed. In the survey, a quantitative questionnaire was conducted through a face-to-face interview. The interview was applied with urban dwellers in public places, e.g., main public square, shopping malls, and busy streets. The questionnaire consisted of a series of questions and exercises divided into three sections. In sections one and two, the support toward wildlife species was elicited. Information about the species was disclosed in three different treatments in between elicitations. In the final section, demographic characteristics of the sample were asked (an English translation of the complete questionnaire is provided, Appendix 1).

3.3.2.1. Comparison between methods to measure support and effect on information disclosure

The methods of money allocation and rating scale were assessed in the survey. For the first, 12 simulated bills were given to the participants (each bill with a value of 1,000 CLP) and requested to be distributed among 12 wildlife species (Gunnthorsdottir 2001; Samples et al. 1986; Tisdell and Wilson 2004; Meuser et al. 2009). It was indicated to the participant that the money would be used to develop activities to protect/conserve the selected wildlife species. Therefore, a higher amount of money would mean more activities, thus a higher chance to protect/conserve a wildlife species. For the rating scale, the participant was asked, "*How strongly do you support or oppose governmental protection of each animal?*" (Liordos et al. 2017a; Knight 2008). The answer was measured using a five-point ordinal rating scale. The participants could choose between five options, ranging from strongly opposing (-2) to strongly supporting (+2). The elicitation of the support was conducted in two rounds. On

round one, colorful pictures, common and scientific names of all the wildlife species were presented to the participant. Afterward, the participant should indicate their support through the two methods, being registered by the interviewer (Appendix 1 questions 1.1 to 1.2).

In round two, to obtain a balanced sample size in each treatment, the participants were assigned in consecutive order to the threatened, endemic and taxonomic group treatment. Using written labels, it was indicated to the participant which species were threatened or endemic and which were not. For the taxonomic treatment, as a control group, it was stated which species were amphibians, fish, and invertebrates, using the same types of labels. The questionnaire was the same for each treatment, but different questions were answered in function of the treatment (Appendix 1, questions 11.1 to 11.2). The values again were registered for the money allocation and rating scale. The specific definitions of threatened and endemic status mentioned to the participants are available in the questionnaire (Appendix 1, question 11.1). We used these ecological traits, as they have been identified as main support drivers, over charisma, aesthetic beauty, or phylogenetic resemblance (Gunnthorsdottir 2001; Tisdell et al. 2007; Colléony et al. 2017a); therefore, we expected a shift in the support.

3.3.2.2. Wildlife species

The 12 wildlife species included in the survey have current distribution in the study area. The species' Threatened status was based on the IUCN Red List of Threatened Species™ (IUCN 2021). The endemic status of the species was determined through the revision of related scientific literature. All mammals and bird species were not threatened or endemic, and the opposite for the other six species. For simplicity, it was told to the participant that a species was in a Threatened status, independently if it were Vulnerable, Endangered, or Critically Endangered. The selected wildlife are presented with their Common name, ABBREVIATION, Taxa – *Scientific name*, respectively: South American Sea Lion, SASL (Mammal - *Otaria flavescens*); Coypo, CYO (Mammal - *Myocastor Coypus*); Many-colored Rush-tyrant, MCRT (Bird – *Tachuris rubrigastra*), Spot-flanked Gallinule, SFG (Bird – *Gallinule melanops*); Coicoi Heron, CH (Bird – *Ardea cocoi*); Chiloe Wigeon, CW (Bird - *Mareca sibilatrix*); Barrio's Frog, BF (Amphibian – *Calyptocephalella gayi*); Freswater Crayfish, FWCF (Crustacean – *Varilastacus araucaninus*); Freshwater Pancora Crab, FWPC (Crustacean - *Aegla manni*); Freshwater Fish, FWF (Osteichthyes - *Cheirodon spp.*); and Common Garden Spider, CGSP (Arachnida – *Doliomalus spp.*).

3.3.2.3. Sampling protocol

The participants were urban dwellers, and the minimum age to be included in the survey was 16 years old. The first author pre-tested the survey by applying the questionnaire to 30 dwellers to highlight pitfalls and possible misinterpretations. The survey was conducted during March and April 2019 by three trained university students (interviewers) with the supervision of the first author. Each interviewer had an identification badge with their name on it, the responsible institution conducting the survey, and a phone number where the interviewee could solve doubts (post-interview). A simple random method was applied to obtain a representative sample of the population of Valdivia. Every fifth potential participant to be included in the data set was asked if they would be interested in an interview with an average duration of 20 minutes. To increase the response rate, each person was told that after completing the questionnaire, a lottery ticket would be given for participation in a voucher of CLP 50,000 (approximately 55 €) to be used at a local grocery store. After receiving consent from the participant, ethical clearance was provided, explaining the study's context, purpose, and possible outcomes and ensuring that their anonymity was guaranteed.

3.3.3.Data analysis

The data set collected for the money allocation and rating scale did not fulfill the requirements for normal distribution. Thus, it was necessary to use non-parametric tests to answer our research questions. To compare the support values elicited by both methods, descriptive statistics were derived as the average and standard deviation. A rank based on the average values was developed for the wildlife species. Additionally, to identify support differences among the wildlife species, a Friedman's ANOVA test was conducted (Akaichi

et al. 2019). The dependent variable for this test can be measured at an ordinal level (Friedman 1937), allowing us to use it for the data obtained with the money allocation and rating scale methods (Field 2017). Subsequently, to generate groups (subsets) among the wildlife species in function of the elicitation values obtained, a pairwise comparison was conducted using a Dunn-Bonferroni test (Dunn 1964). The generated subsets will allow us to assess similarities and differences among the methods before and after information disclosure. To assess the changes of support toward the wildlife species, from round one to round two for both methods, a Sign test was conducted. Although it is recommended to use the Wilcoxon matched-pair signed-rank test over the Sign test (Field, 2017), the first was left aside because overall, the distribution of the support difference for the wildlife species from round one to two were not symmetrical. All analyses were conducted using the software IBM SPSS® 27 for Windows®

3.4. Results

3.4.1. Questionnaire response and socio-demographic characteristics

A total of 359 questionnaires were completed with 211 refusals, yielding a response rate of 59%. In Table 8 the results from the sample and the last national census (INE 2017), are presented for the variables of gender, age, and education level, and their categories. The aim was to assess the representativeness of our sample. For the variable age, different ranges are presented due to the availability of the data from the last national census. As indicated, middle-aged and highly educated respondents are slightly over-represented in the sample.

Table 8 Socio-demographic characteristics of the sample; chapter two (n: 359).

Gender			**Age**				**Education Level**		
Categories	**Study area** [a]	**Sample** [b]	**Study area** [a]		**Sample** [b]		**Categories**	**Study area** [a]	**Sample** [b]
	Percentage		**Ranges**	**Percentage**	**Ranges**	**Percentage**		**Percentage**	
Female	50.93 %	50.14 %	15-19	7.85 %	16-20	5.29 %	Primary school	25.32 %	0.28 %
Male	49.07 %	47.91 %	20-29	18.40 %	21-30	35.93 %			
			30-39	13.60 %	31-40	20.06 %	Higher school	24.12 %	20.61 %
			40-49	12.68 %	41-50	18.38 %			
			50-59	12.72 %	51-60	13.37 %	University or Technical	41.88 %	75.21 %
			60-69	8.58 %	61-70	5.57 %			
							Postgraduate	2.19 %	1.95 %

a Values obtained from the last national census conducted in Chile (INE 2017). *Ranges do not sum up 100% due to not included categories (except gender).*

b Percentages for the sample data do not sum up 100% due to missing values.

3.4.2.Support elicited by two methods, money allocation and rating scale, providing colorful pictures and scientific and common names

In round one, the ranking of the average values for the money allocation and rating scale methods have a concordance for nine of the 12 species, MCRT, SFG, CH, CW, CYO, CT, BF, FWPC, and CGSP (Table 9 round one columns). The results of Friedman's ANOVA test indicate a significant difference in the support among the wildlife species elicited by the money allocation and rating scale, X^2 *(11) 1559.842,* $p < .000$, and X^2 *(11) 908.715,* $p < .000$, respectively, in round one. Furthermore, the pairwise comparison, i.e., Dunn-Bonferroni post-hoc tests, between the wildlife species for money allocation and rating scale indicates differences based on the subset's integration and arrangement (Figure 4, round one). Each pairwise comparison (block) corresponds to the money allocation or rating scale support elicitation of the 12 wildlife species. The blocks are integrated by several columns, from now on subsets. The specific number of subsets per block is based on the pairwise comparison results. At the same time, each subset is integrated by wildlife species without a statistically significant difference ($p < .05$) in the support received. As a pairwise comparison, the same species may be included in several subsets in the same block. Finally, in each block, the subsets are arranged according to the received support, from the right to the left border, indicating high or low support, respectively. For round one (elicitation of support providing colorful pictures, scientific and common names of the wildlife species), the blocks of money allocation and rating scale vary on the number and arrangement of the subsets (Figure 4, round one). The money allocation and rating scale blocks are conformed by eight and seven subsets, respectively. Regarding differences in the blocks' integration between money allocation and rating scale, an example is the highest supported block from both methods. The money

allocation block is integrated by one species, MCRT (bird), while the rating scale is integrated by the MCRT, CH, SFG, and CH (birds). The arrangement of the subsets and the wildlife species that integrate them are visible in Figure 4.

Table 9 Descriptive statistics of studied variables; chapter two.

Wildlife species [a]	**Round one:** Providing colorful pictures and scientific of the wildlife species (n: 359)				**Round two**: disclosing ecological traits of the wildlife species											
					Threatened status (n: 138)				**Endemic status** (n: 123)				**Taxonomic group** (N: 94)			
	Money allocation [b]		**Rating scale [c]**		**Money allocation [b]**		**Rating scale [c]**		**Money allocation [b]**		**Rating scale [c]**		**Money allocation [b]**		**Rating scale [c]**	
	x̄	*SD*	*X̄*	*SD*	*x̄*	*SD*	*X̄*	*SD*	*x̄*	*SD*	*X̄*	*SD*	*x̄*	*SD*	*x̄*	*SD*
MRCT	2,181.56 (**1**)	903.15	1.0780 (**1**)	.4602	1,115.94 (**6**)	936.47	1.0725 (**2**)	.3113	1,089.43 (**6**)	896.33	1.1382 (**3**)	.4239	1,978.72 (**1**)	927.23	1.1277 (**1**)	.3661
SFG	1,6667.60 (**2**)	776.84	.9944 (**2**)	.5138	553.96(**9**)	781.79	.9416 (**7**)	.4815	560.98 (**8**)	769.78	1.0164 (**6**)	.5140	1,404.26 (**3**)	833.69	1.0538(**3**)	.4002
CH	1,620.11 (**3**)	730.17	.9666 (**3**)	.5275	586.96 (**8**)	789.79	.9783 (**6**)	.4266	642.28 (**9**)	831.06	1.0163 (**7**)	.5119	1,414.89 (**2**)	709.53	1.0638 (**2**)	.40998
CW	1,416.20 (**4**)	818.19	.9053 (**4**)	.6136	456.52 (**11**)	674.02	.8188 (**10**)	.6070	528.46 (**10**)	771.68	.9512 (**9**)	.6121	1,170.21(**4**)	837.79	.9468 (**4**)	.5558
CYO	1,195.53 (**5**)	774.80	.7346 (**5**)	.7368	536.23 (**10**)	746.37	.8551 (**9**)	.5609	463.41 (**11**)	604.53	.9187 (**10**)	.5950	989.36 (**7**)	740.45	.7742 (**7**)	.7091
BF	790.50 (**6**)	704.70	.7075 (**6**)	.7442	1,586.96 (**2**)	691.22	1.0863 (**1**)	.5314	1,634.15 (**2**)	715.96	1.1707 (**1**)	.4564	1,117.02 (**5**)	745.69	.9149 (**5**)	.5615
CT	768.16 (**7**)	770.17	.6462 (**7**)	.7587	1,659.42 (**1**)	749.66	1.0719 (**4 - 3**)	.5728	1,650.41 (**1**)	746.40	1.1382 (**2**)	.4674	1,010.64 (**6**)	822.99	.8404 (**6**)	.6274
SASL	715.08 (**8**)	800.80	.4819 (**10**)	.9360	318.84 (**12**)	579.27	.5290 (**12**)	.7941	292.68 (**12**)	568.74	.5203 (**12**)	.8622	606.38 (**10**)	750.89	.3936 (**12**)	.9752
FWCF	533.52 (**9**)	667.57	.5738 (**8**)	.7655	1,492.75 (**3**)	747.22	1.0719 (**3 - 4**)	.5056	1,512.20 (**3**)	803.33	1.0976 (**4**)	.5027	680.85 (**8**)	736.35	.7447 (**9**)	.6868
FWF	458.10 (**10**)	586.67	.5487 (**9**)	.8100	1,485.51 (**4**)	1,172.90	1.0507 (**5**)	.5172	1,317.07 (**4**)	760.90	1.0650 (**5**)	.5543	638.30 (**9**)	701.01	.7527 (**8**)	.6861
FWPC	351.96 (**11**)	523.01	.4262 (**11**)	.8387	1,159.42 (**5**)	747.22	.8705 (**8**)	.6898	1,211.38 (**5**)	770.91	1.0000 (**8**)	.6005	489.36 (**11**)	617.74	.6277 (**10**)	.7182
CGSP	287.71 (**12**)	548.40	.1616 (**12**)	.9897	1,065.22 (**7**)	727.02	.7338 (**11**)	.8390	1,065.04 (**7**)	743.72	.8699 (**11**)	.7238	457.45 (**12**)	633.56	.4681 (**11**)	.8639

[a] *MCRT: Many-colored Rush-tyrant (Tachirus rubigstra); SFG: Spot-flanked Gallinule (Gallinula melanopis); CH: Coicoi Heron (Ardea coicoi); CW: Chiloe Wigeon (Mareca sibilatrix); CYO: Coypo (Myocastor coypus);SASL: South American Sea Lion; CT: Chilean Toad (Calyptocephalella gayi); BF: Barrios Frog (Insuetophrynus acarpicus); FWCF: Freshwater Crayfish (Varilastacus araucanis); FWPC: Freshwater Pancora Crab (Aegla manni); FWF: Freshwater Fish (Cheirodon spp.); CGSP: Common garden spider (Doliomalus spp.).*

[b] *Values ranging from 1,000 to 12,000 CLP. It must be noticed that usually, the maximum amount received for the most supported wildlife species was around 3,000 CLP, by each participant.*

[c] *Values ranging from -2 to +2, "strongly oppose for governmental protection" and "strongly support governmental protection," respectively*

3.4.3. Differences in the support elicited toward wildlife species by two methods, money allocation and rating scale, after information disclosing

After information disclosure of the wildlife species threatened and endemic status and which species are amphibians, fish, and invertebrates (last six species in Table 10), the change in the support, from round one to two, was different based on the method used. Generally, for the three treatments, in the money allocation, there is a significant increment for the last six listed species and a decrease of support for the first six species (positive and negative value, respectively, of the Standardized Test Statistic, Table 10, money allocation columns). On the other hand, overall, in the rating scale, there was only a significant increment of support for the last six wildlife species, while for the first six, the support did not have a significant change (Table 10, rating scale columns). Exceptions to this last are the CYO in the rating scale for the threatened treatment and the CYO and SASL for the taxonomic treatment in the money allocation. At a more specific level, it is also possible to identify how the participants changed their support after disclosing the information, based on the positive, negative, and ties values presented under the Standardized Test Statistics, right, left, and middle, respectively (Table 10). For example, for the SASL (not Threatened species), after disclosing the threatened status, 43 participants took one or more bills, 89 did not change the initially allocated bills, and six increased in at least one bill.

Table 10 Differences of support after disclosing information of wildlife species.

Wildlife Species [a]	Threatened status						Endemic status						Taxonomic group					
	Money allocation			Rating scale			Money allocation			Rating scale			Money allocation			Rating scale		
MCRT		**- 9.166 *****			**1.206**			**- 7.918 *****			**.000**			**- 3.175 *****			**.000**	
	86	52	0	3	127	8	66	56	1	4	115	4	12	82	0	6	82	6
SFG		**- 8.918 *****			**.000**			**- 8.374 *****			**-.873**			**- 2.750 ***			**.459**	
	90	46	3	10	117	9	75	47	1	13	101	8	14	78	2	8	73	11
CH		**- 9.333 *****			**1.367**			**- 7.086 *****			**.000**			**- 3.098 ****			**1.336**	
	92	45	1	6	119	13	63	56	4	13	96	14	14	79	1	4	80	10
CW		**- 8.806 *****			**- 1.919**			**- 7.945 *****			**.359**			**- 2.910 ****			**1.033**	
	88	47	3	16	116	6	68	54	1	14	92	17	15	77	2	5	79	10
CYO		**- 6.515 *****			**2.688 ****			**- 6.813 *****			**1.886**			**- 1.871**			**.834**	
	71	56	11	11	98	29	64	53	6	11	88	23	11	80	3	9	70	14
SASL		**- 5.143 *****			**.658**			**- 5.709 *****			**.000**			**- 1.155**			**- .436**	
	43	89	6	16	101	21	40	81	2	17	88	18	3	91	0	12	73	9
CT		**8.386 *****			**7.551 *****			**7.390 *****			**5.515 *****			**2.460 ***			**4.199 *****	
	5	47	86	0	80	50	5	48	70	5	73	45	4	74	16	3	64	27
BF		**8.401 *****			**7.291 *****			**7.789 *****			**5.835 *****			**4.400 *****			**2.919 ****	
	3	54	81	1	80	58	3	49	71	3	76	44	1	69	24	4	71	19
FWCF		**8.529 *****			**8.070 *****			**7.685 *****			**6.326 *****			**.630**			**3.200 ****	
	6	41	91	1	68	7	4	47	72	5	63	55	4	83	7	4	69	21
FWPC		**9.180 *****			**7.442 *****			**8.125 *****			**6.044 *****			**2.000 ***			**3.469 *****	
	2	44	92	2	74	63	0	55	68	4	70	49	1	85	8	5	64	25
FWF		**9.125 *****			**7.938 *****			**7.257 *****			**6.068 *****			**3.015 *****			**2.345 ***	
	2	45	91	0	73	65	5	50	68	6	63	54	0	83	11	5	71	17
CGSP		**9.116 *****			**7.660 *****			**8.008 *****			**6.803 *****			**2.041 ***			**3.834 *****	
	1	49	88	3	67	69	1	53	69	4	60	59	0	88	6	4	64	26

[a] *MCRT: Many-colored Rush-tyrant (Tachirus rubigstra); SFG: Spot-flanked Gallinule (Gallinula melanopis); CH: Coicoi Heron (Ardea coicoi); CW: Chiloe Wigeon (Mareca sibilatrix); CYO: Coypo (Myocastor coypus); SASL: South American Sea Lion; CT: Chilean Toad (Calyptocephalella gayi); BF: Barrios Frog (Insuetophrynus acarpicus); FWCF: Freshwater Crayfish (Varilastacus araucanis) FWPC: Freshwater Pancora Crab (Aegla manni); FWF: Freshwater Fish (Cheirodon spp.); CGSP: Common garden spider (Doliomalus spp.). These last six species are in a threatened and endemic status.*

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

3.4.4.Support elicited by two methods, money allocation and rating scale, after disclosing ecological traits of the wildlife species

Based on the ranking of the average values, two species, SASL and FWCF, for the threatened status, and one species, SASL, for the endemic treatment, have a rank concordance between money allocation and rating scale methods, Table 9, threatened and endemic status column. For the taxonomic group (control group), seven species, MCRT, SFG, CH, CW, CYO, CT, and BF, presented a concordance in the rank, Table 9, taxonomic group column. The results of the Friedman's ANOVA indicate a significant difference in the support received among the wildlife species for the three treatments in money allocation and rating scale methods, after information disclosure, threatened status: money allocation: X^2 *(11) 421.074,* $p < .000$ / rating scale*:* X^2 *(11) 207.443,* $p < .000$; endemic status: money allocation: X^2 *(11) 362.861,* $p < .000$ / rating scale*:* X^2 *(11) 204.894,* $p < .000$; and taxonomic group: money allocation: X^2 *(11) 257.427,* $p < .000$ / rating scale: X^2 *(11) 206.852,* $p < .000$. Furthermore, the pairwise post-hoc comparison indicates a different arrangement and integration of the subsets from round one to round two (Figure 4, round two). In the money allocation, the species where the threatened and endemic status was indicated (red and green dots, respectively) were grouped in the same subsets (Figure 4, threatened and endemic treatments). Additionally, these subsets were grouped in the high supported border of the block (right). An exception for the aforementioned is the MCRT, the only species in the same subsets as the threatened or endemic species. Finally, the species not in a threatened or endemic status (without red or green dots) were grouped in one subset. In the case of the rating scale, the species highlighted for threatened and endemic status were not exclusively integrated into subsets. Contrarily, the subsets were conformed with wildlife species being threatened or endemic or not. In the taxonomic group treatment (Figure 4, round two), for both blocks, money allocation and

rating scale, the integration and arrangements of the subsets are more similar to round one (Figure 4, round one). This last could be because the information disclosed in the control group was not relevant enough to increase the support. It must be noted that the Sign Test (Table 10) assessed a statistically significant difference for the taxonomic group. However, the positive differences were not higher than the ties (Table 10, taxonomic group columns).

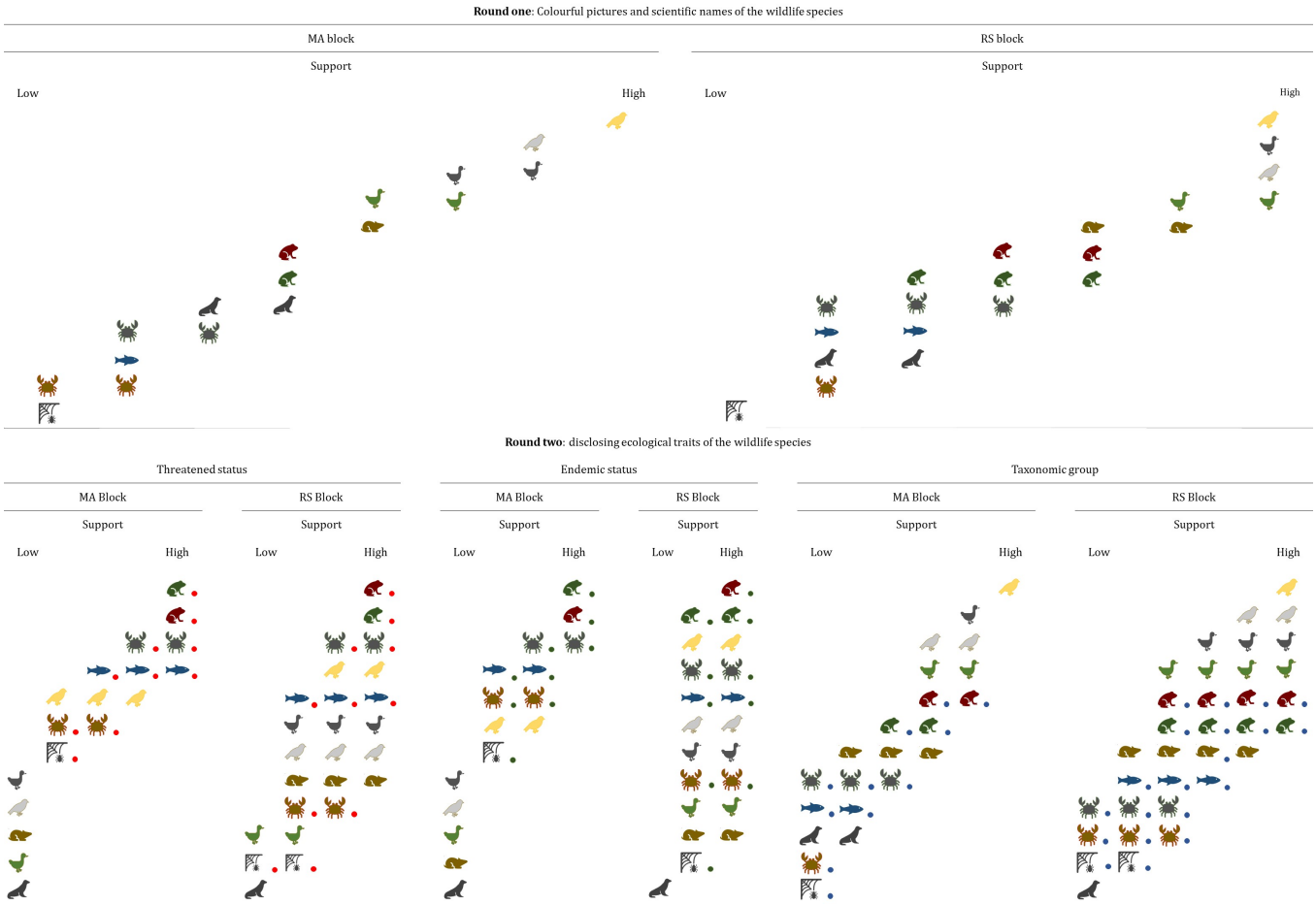

Figure 4 Groups of wildlife species (columns) based on the received support elicited by two methods money allocation (MA) and rating scale (RS), in two consecutive rounds for each, as assessed by a pairwise post hoc Dunn-Bonferroni test after significant Friedman's ANOVA ($p < .05$). First (round 1) providing color pictures and scientific and common names (above), and afterward (round 2) disclosing different ecological traits of the wildlife. For the threatened and endemic status (below; left and middle columns), it was mentioned which species were in the corresponding status (red and green dots, respectively), and for the taxonomic group (right columns), it was indicated which species were amphibians, fish, and invertebrates (blue dots).

- Many-colored Rush-tyrant (*Tachirus rubigstra*)
- Spot-flanked Gallinule (*Gallinula melanopis*)
- Coicoi Heron (*Ardea coicoi*)
- Chiloe Wigeon (*Mareca sibilatrix*)
- Coypo (*Myocastor coypus*)
- South American Sea Lion (*Otaria flevescens*)
- Chilean Toad (*Calyptocephalella gayi*)
- Barrios Frog (*Insuetophrynus acarpicus*)
- Freshwater Fish (*Cheirodon spp.*)
- Freshwater Crayfish (*Varilastacus araucanis*)
- Freshwater Pancora Crab (*Aegla manni*)
- Common garden Spider (*Doliomalus spp.*)

3.5. Discussion

Based on the research questions, similarities and differences were found between the money allocation and rating scale methods to elicit the support toward wildlife species and identify support changes before and after disclosing ecological traits of the species. Providing colorful pictures, scientific and common names, the wildlife species had almost a complete concordance of rank between the money allocation and rating scale (Table 9, round one). Based on the pairwise comparison (Figure 4, round one), the species presented differences in the integration and arrangements of the subsets. After disclosing the ecological traits and eliciting the support again, the wildlife species, overall, showed discordance in the rank between the methods (Table 9, round two columns). Furthermore, the sign test (Table 10) identified a significant increase and decrease of support toward the species based on the money allocation. At the same time, the rating scale only assessed a support increment for most species. Finally, according to the pairwise comparison, in the money allocation, the species were overall grouped based on the threatened and endemic status (information disclosed to the participants), while in the rating scale were not (Figure 4, round two).

3.5.1. Support elicited by two methods, money allocation and rating scale, providing colorful pictures and scientific and common names

A difference in our results between the money allocation and rating scale is the number of wildlife species integrating each subset. Generally, the money allocation present fewer wildlife species in each subset, while more in the rating scale. This last is evidenced clearly in the first subset. For the money allocation, only one species integrated the first subset, MCRT, and in the rating scale, it was integrated by four species, MCRT, SFG, CH and CW. The aforementioned could be explained by the differences in the participant's answers between money allocation and rating scale. It was not rare that a participant gave the same response for all wildlife species in the rating scale; "*strongly support governmental protection for the wildlife species*" (+1). In contrast, in the money allocation, the same participants did not equal the bills among the species. Oppositely, while some species received more than one bill, others did not receive any. Related to which wildlife species integrate which subsets, based on Figure 4, it is possible to evidence a tendency to support wildlife species based on a hierarchical phylogenetic order (Gunnthorsdottir 2001; Knight 2008; Liordos et al. 2017a; Liordos et al. 2020). For example, in a cross-countries study, a correlation was identified between support and species phylogenetically close to humans (Albert et al. 2018), but in a local context, an exception to this rule is not rare (Liordos et al. 2017a; Liordos et al. 2020). Our results illustrate this exception in the subsets integrated by the SASL. In the money allocation, the SASL shares subsets with amphibians and crustaceans, while in the rating scale, it shares subsets with the CT, FWCF, FWPC, and FWF. Overall, the money allocation has fewer wildlife species integrating each subset than the rating scale, making it clearer to distinguish support differences among the species.

3.5.2. Support elicited by two methods, money allocation and rating scale, after disclosing ecological traits of the wildlife species

After disclosing the corresponding information in each treatment, a support change was identified both for money allocation and rating scale. We will not deepen this topic, as it is not the scope of the study and has been widely assessed (Tisdell et al. 2007; Tisdell and Wilson 2004, 2006; Tisdell 2006). The control group was also statistically significantly different. Still, based on the positive and negative ties (Table 10, taxonomic group table), these differences were less than the threatened or endemic treatment (for statistically significant results, please refer to Espinosa-Molina et al. (2021). Few studies have assessed the general public's effect of information disclosure toward wildlife species, even less comparing different methods to elicit support. One was conducted by Tisdell and Wilson (2004) among Australian urban dwellers. They used five methods to assess the effect of information provision on the support among tree Kangaroos. The methods were two dichotomic answers (yes or no), two contingent valuation methods, and allocating a fixed amount of conservation funds, or money allocation. The only method that spotted a significant difference was the money allocation, congruent with our findings.

An advantage of the pairwise comparison (Figure 4, round two) is the detailed information of the support changes toward the wildlife species, allowing an accurate interpretation of the results. Based on the integration and arrangement of the wildlife species subsets, threatened and endemic treatment, it is possible to identify differences in the effect of information disclosure on the support between the money allocation and rating scale (Figure 4, round two). In the money allocation, the subsets were mostly integrated by species in a threatened or endemic status. In contrast, in the rating scale the subsets were integrated by both wildlife

species, threatened and endemic and not (Figure 4, round two). The difference between the wildlife species subsets integration could be due to the following fact. If the participant wanted to support a threatened or endemic wildlife species, in the money allocation method, the bills (support) must be taken from another species. Oppositely, in the rating scale method, there is no need to decrease the support of a wildlife species to increase to another. If the objective of a project aims to elicit preferences of specific wildlife species over others or assess support changes, the money allocation would be a more accurate method than the rating scale. Additionally, the money allocation is a suitable alternative to avoid the participants giving support to species due to the social desirability bias (where the participants try to answer what they think is expected by the interviewer). Generally, people provide more positive answers in the rating scale, particularly in face-to-face interviews (Coolican 2014).

3.5.3. Methodological approach

Both methods presented a practical application, i.e., understandable and easy to follow, among the urban dwellers in face-to-face interviews. In the following paragraphs, the main characteristics of the money allocation and rating scale to assess support changes toward wildlife species will be mentioned.

After information disclosure, the arrangement and integration of the subsets respond to the characteristics of the methods. The money allocation is a constraint choice, meaning that the method obligates the participants to choose which wildlife species to support (Champ et al. 2017), not been the case for the rating scale. If a participant wants to give maximum support to one wildlife species in the money allocation, the only possibility would be to allocate 12 bills to one and none to the other species. Oppositely, in the rating scale, the participants can

give maximum support to all the wildlife species. These differences are based on the objective of each method. The money allocation is subject to budget constrain, revealing more easily the participant preferences from one wildlife species to another (Champ et al. 2017). The rating scale aims to measure attitudes (Coolican 2014; Likert 1932), and it has been used in the human-wildlife dimension to correlate the support toward wildlife species with explanatory variables (Liordos et al. 2020; Liordos et al. 2017a; Hermann et al. 2013). This characteristic of the money allocation, forcing the participants to choose, accentuates the participant's preferences, i.e., support, over the rating scale.

To conclude, the money allocation and rating scale methodologies could elicit urban dwellers' support toward wildlife species. Additionally, it is possible to assess the support for several wildlife species through one question. Our results, specifically Figure 4, could illustrate the conflict-to-coexistence continuum (Frank and Glikman 2019). Furthermore, the support of a specific human-wildlife interaction can be elicited over time to identify its evolution and, e.g., assessing a conservation strategy's effectiveness to transform an HWC into a human-wildlife coexistence (independent of the drivers of the conflict). Based on our findings, the money allocation presented a better capacity to assess support changes after information disclosure, making it a more appropriate method over the rating scale. In addition, the desirability bias could be less in the money allocation, as participants are forced to decide which species to support, compared to the rating scale, where it is possible to give maximum support to all wildlife species.

3.5.4. Open research question

Generally, the effect of information disclosure on the support toward wildlife species has been tested, providing the same attribute and assuming the same outcome. An example is disclosing ecological traits of wildlife species, expecting an increment of support to the species being in a threatened status (Samples et al. 1986; Tisdell and Wilson 2006, 2004; Tisdell et al. 2007). Under the assumption that information can change general public support toward wildlife species, it is possible to ask, could it also be affected by, e.g., mass media news about a species impacting humans directly or indirectly? or due to changes in governmental wildlife management policies? There is evidence of a correlation between support and the before-mentioned cases (Bombieri et al. 2018; Knight 2008), but no studies have measured the support before and after a HWC event. In need of a strategy to measure human-wildlife interactions in the long term (Dressel et al. 2015; IUCN 2020), a next step would be to identify the real-world effect, e.g., HWC mass media news, on the support toward the species involved in the conflict. Our results suggest that the money allocation might provide a better and more sensitive measurement of such changes than the rating scale.

4. Assessing a human-wildlife interaction before and after a news media coverage of a human-wildlife conflict event and comparing two methods to measure support, money allocation and rating scale

4.1. Abstract

There is growing evidence associating human-wildlife conflicts (HWC) news media and people´s attitudes and support toward wildlife conservation. However, few studies have assessed changes in these attributes after HWC-news media coverage. Here, a human-wildlife interaction was evaluated before and after a nationwide news media coverage of an HWC involving a South American Sea Lion population in Southern Chile. The human-wildlife interaction between 12 native wildlife species and dwellers was defined by the attributes of knowledge (perception) of their threatened status, support for conservation, and aesthetic and negativistic attitudes. Additionally, the support was elicited using two different methods; money allocation and rating scale. Face-to-face interviews were conducted using the same questionnaire among urban dwellers before [2018 (n: 368)] and after [2019 (n: 358)] the news media coverage. Results indicate that 66.57% (n: 234) of the participants were aware of the HWC. After the news media coverage, a shift in the human-wildlife interaction was assessed. The South American Sea Lion was perceived uglier (aesthetic), participants were more afraid (negativistic) of an encounter in the wilderness, the misperceived knowledge (perception), of threatened status, increased. Also, the South American Sea Lion support decreased based on the average values of the money allocation and rating scale. When the South American Sea Lion position is compared with the other wildlife species, there was a decrease based on the money allocation, while the rating scale presented an increase. Longitudinal research represents a powerful means to comprehend the span of human-wildlife interactions within the conflict-to-coexistence continuum. Within this context, the money allocation could represent a plausible alternative to assess human-wildlife interactions over time

4.2. Introduction

4.2.1.Study field framework

Human-wildlife interactions can be pushed towards coexistence or conflict due to different factors. One studied factor is information about wildlife species, which can affect the support for wildlife species based on the type of information disclosed to the participant (Tisdell 2006; Tisdell and Wilson 2006; Tisdell et al. 2007; Tisdell and Wilson 2004; Espinosa-Molina 2019; Espinosa-Molina et al. 2021; Espinosa-Molina and Beckmann 2022). We live in the "Information Era," and news media coverage of a human-wildlife conflict event can instantly reach any part of the world and potentially affect attitudes and behaviors towards specific wildlife species among mass media consumers (Arbieu et al. 2019). It is suggested that news media, as an updated source of information, constitute an essential component in shaping human-wildlife interactions (Houston et al. 2010; Ballejo et al. 2021; Fernández-Gil et al. 2016; Johansson et al. 2017). Furthermore, how information or news media are framed affects people's attitudes concerning a specific topic (Shen 2004; van Klingeren et al. 2015; Kusmanoff et al. 2020; Soroka 2006). Furthermore, news media can constitute a misinformation source about wildlife species for the general public (Fernández-Gil et al. 2016). As one primary challenge in nature conservation is to reach a human-wildlife coexistence state (Frank et al. 2019; IUCN 2020a), it becomes strategic to continue comprehending the news media's capacity to shift human-wildlife interactions.

Within the news media's role in the human-wildlife interaction research field, it is possible to differentiate types of research method frameworks. One type of research design structure focuses on how the content or information related to wildlife species, or human-wildlife

interactions, is presented or framed to the consumer or general public. The information can be presented as news media content (Houston et al. 2010; Mammola et al. 2020; Wu et al. 2018); social media content (Toivonen et al. 2019; Nanni et al. 2020), and media reports (Bombieri et al. 2018). Similar, other research design structure, besides identifying how information is framed or presented to news media consumers, aims to connect this last with people's attitudes or behaviors towards wildlife species (Ballejo et al. 2021; Correia et al. 2021; Fidino et al. 2018). However, research method frameworks focusing on people's attitudes or behavior changes after a, e.g., news media coverage of a human-wildlife conflict event, are rare, if not inexistent. If news media about human-wildlife conflicts could constitute a driver shifting human-wildlife interactions between conflict and coexistence within the conflict-to-coexistence continuum (Figure 5, letter l) (Frank and Glikman 2019), it would be helpful to deep into this topic as a strategy to contribute in pursuing a human-wildlife coexistence state.

An alternative to assess specific human-wildlife interaction shifts before and after a mass media coverage of a human-wildlife conflict event could be to quantify specific attribute changes. Different attributes (or variables) have been defined and studied in the human-wildlife interaction research field, e.g., support and attitudes towards and knowledge about wildlife species (Figure 5, letters b, c, and d). The first has been defined as "…*preferences or attitudes that directly or indirectly reflect a person's desire for a wildlife species population to maintain or increase over time in a specific area*…" (Espinosa-Molina and Beckmann 2022, p. 3). Usually, the support has been used as a response variable in research method frameworks (DeKay and McClelland 1996; Gunnthorsdottir 2001; Meuser et al. 2009; Samples et al. 1986; Tisdell and Wilson 2004, 2006; Espinosa-Molina et al. 2021; Espinosa-Molina and Beckmann 2022). On the other hand, explanatory attributes have been used; such as aesthetic or negativistic attitudes, i.e., how beautiful and how much fear a wildlife species evoke, respectively (Liordos

et al. 2017a; Knight 2008; Espinosa-Molina and Beckmann 2022; Jaunky et al. 2021). The knowledge about wildlife species has also been used to assess their effect on the support towards wildlife species (Tisdell et al. 2007; Tisdell and Wilson 2004; Espinosa-Molina et al. 2021; Espinosa-Molina and Beckmann 2022; Jaunky et al. 2021; Lundberg et al. 2019). Additionally, it has been identified, mostly in observational research design structures (Newing 2010), that new information disclosed to the participants of a survey, e.g., the threatened status category, overcomes aesthetic or negativistic attitudes as the main support driver (Tisdell 2006; Tisdell et al. 2007; Tisdell and Wilson 2004, 2006; Espinosa-Molina et al. 2021). Since the before-mentioned attributes have been widely studied in the human-wildlife interaction research field, they were considered an appropriate alternative to be used as a proxy to reflect a human-wildlife interaction state and measure their changes after a news media coverage of a human-wildlife conflict.

Additionally, two main methods have been used when assessing support changes towards wildlife species by the general public. One is the money allocation (Meuser et al. 2009; Samples et al. 1986; Tisdell and Wilson 2006; Espinosa-Molina et al. 2021; Espinosa-Molina and Beckmann 2022), and the second, rating scale (Espinosa-Molina and Beckmann 2022; Whitehouse-Tedd et al. 2020). These two methods are scaling techniques that can be classified into comparative and non-comparative, money allocation and rating scale, respectively (Malhotra et al. 2017). Based on this classification, the money allocation allows direct comparison of the stimulus objects (wildlife species), while with the rating scale, "…*each object is scaled independently of the others in the stimulus set*…" (Malhotra et al. 2017, p. 343). This distinction between the money allocation and rating scale could represent a substantial disparity in assessing support changes towards wildlife species by the general public in a

longitudinal study design, as these two methods have presented significant differences in an observational research framework (Espinosa-Molina and Beckmann 2022).

4.2.2.Social-ecological context and human-wildlife conflict event

In Valdivia, southern Chile, an unprecedented ecological interaction between two native charismatic wildlife species occurred, escalating into a conflict, with extensive news media coverage. Valdivia is located in one of the biodiversity hotspots (Mittermeier et al. 2011), surrounded by the "Cruces" river wetland. Valdivia dwellers co-habitat with several wildlife species, such as the South American Sea Lion (*Otaria byrona*) and the Black-necked Swan (*Cygnus melancoryphus*). The South American Sea Lion has a constant colony on the riverbank next to a local farmer and fisherman market, wildly visited by dwellers and tourists. Besides being cherished locally and nationwide, the Black-necked Swan population in the "Rio Cruces" wetland represents South America's most important breeding site (Jaramillo et al. 2018; BirdLife International 2016). The awareness and support among Valdivian dwellers towards the Black-Necked Swan probably increased exponentially after an industrial pollution episode in 2004. In that episode, an environmental disaster occurred, nearly eradicating the entire swan population from the "Cruces" river wetland (Lopetegui et al. 2007; Jaramillo et al. 2018).

In 2018, the "Rio Cruces" Wetland Black-Necked Swans population was again jeopardized. South American Sea Lion individuals started predating on Black-Necked Swans, being the first time this ecological interaction was recorded between these two species in the "Cruces" river wetland (Swan et al. 2020). In September 2018, the event became public, with massive news media coverage on a regional and national scale (Figure 5, letter e) (Palma 2018; Salinas 2018; Villalobos D 2018; Bevilacqua 2018). The predation of Black-Necked Swans, from now on HWC-event, besides the impact on their population, the general public's perception and attitudes towards the South American Sea Lion, has not been a matter of study, which

could allow understanding the potential effect of news media coverage of a human-wildlife conflict on human-wildlife interactions (Figure 5, letter h).

4.2.3.Research context and aim

In the context of an M. Sc. thesis (Espinosa-Molina 2019), a survey was conducted in Valdivia among urban dwellers in 2018, before the HWC-event previously described (Figure 5, letter f). The survey consisted of face-to-face interviews (Figure 5, letter i) to elicit attributes from 12 native wildlife species (Figure 5, letter a) occurring in the "Rio Cruces" wetland, one being the South American Sea Lion (Espinosa-Molina et al. 2021). Among the attributes elicited were the knowledge (or perception) about threatened status, support, and aesthetic and negativistic attitudes towards the 12 wildlife species (Figure 5, letters b, c, and d). After the HWC-event, it was decided (proposed by the local NGO www.cehum.org) to repeat the same survey applied in 2018 (Figure 5, letter g). The main aim was to assess shifts in the human-wildlife interactions, i.e., between the South American Sea Lion and Valdivia dwellers, after the news media coverage of the HWC-event (Figure 5, letter e). The human-wildlife shift will be assessed by comparing the attributes of support, aesthetic and negativistic attitudes, and knowledge of the threatened status before and after the HWC event (Figure 5, letter h).

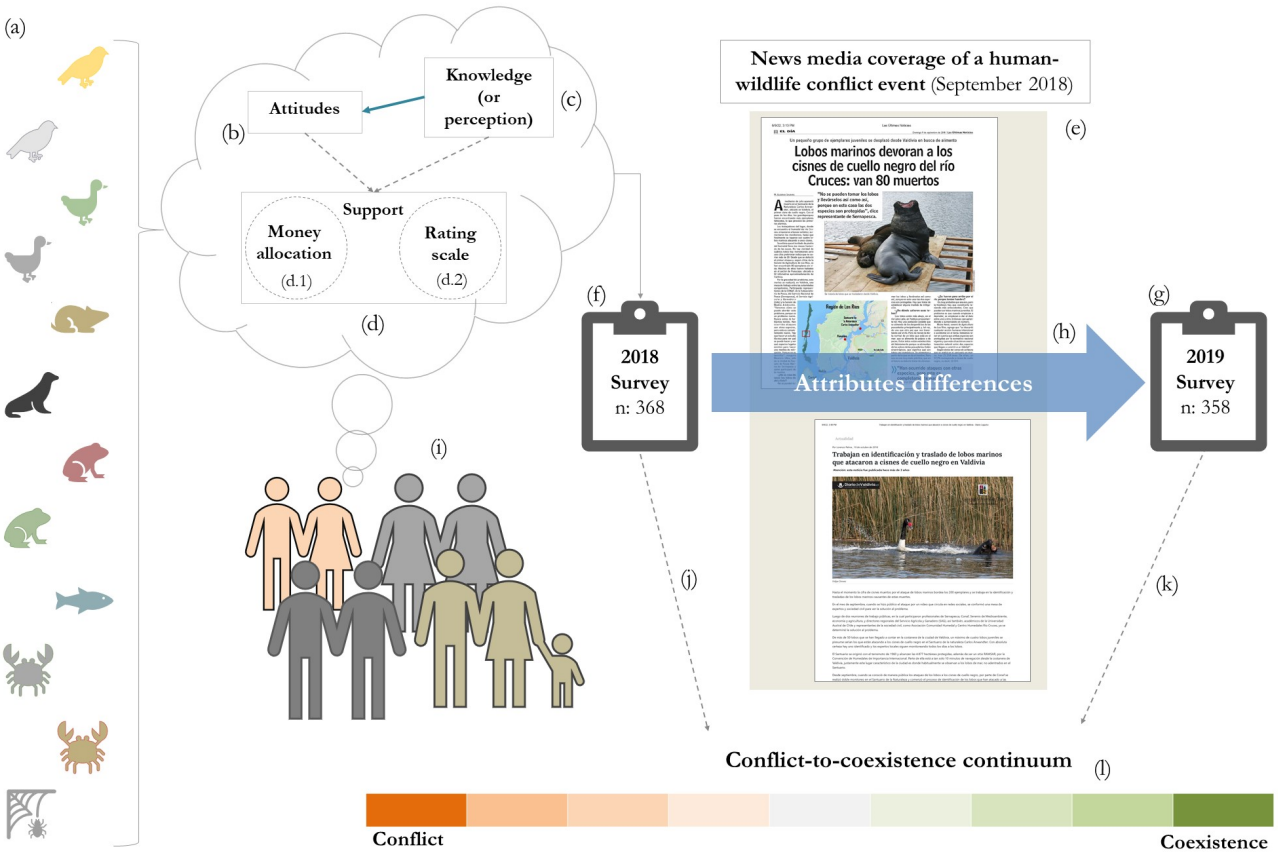

Figure 5 Research design structure for chapter four (source of news media: (Palma 2018; Salinas 2018)

To our knowledge, no study has assessed a specific human-wildlife interaction before and after a news media coverage of an HWC with an ex-ante and ex-post survey in a single research framework. Furthermore, it is the first time that two methods to elicit support, i.e., money allocation and rating scale (Figure 5, d.1 and d.2, respectively), are compared in the same longitudinal survey in the human-wildlife interaction research field. Among human-wildlife interaction longitudinal studies, there is little consistency in the conceptualization and measurement of the attributes used to compare acceptance levels or individual preferences toward a wildlife species population (Treves et al. 2013; George et al. 2016). Therefore, the present case study provides an opportunity to assess differences between these two methods, if any, to identify support changes towards the South American Sea Lion after the HWC-event covered by the news media.

Based on the precedents provided above, we have formulated the following research questions,

1. Which percentage of the sample is aware of the HWC-event, and which was their information source?
2. What are the differences between support, money allocation and rating scale, towards the South American Sea Lion, and within other wildlife species, before and after the HWC-event?
3. What are the differences in the participant's knowledge (perceived) threatened status about and aesthetic and negativistic attitudes towards the South American Sea Lion before and after the HWC-event?

4.3. Methodology

This research is part of a broader investigation. Other results have already been published (Espinosa-Molina et al. 2021; Espinosa-Molina and Beckmann 2022). References to these preceding publications will be referred to whenever appropriate.

4.3.1.Study Area

The study area corresponded to the City of Valdivia, located approximately 850 kilometers south of Santiago, the capital of Chile. According to the last national census, Valdivia has 166.080 inhabitants (INE 2017). For more references on the study area characteristics, please refer to Espinosa-Molina et al. (2021) and Espinosa-Molina and Beckmann (2022).

4.3.2.Survey design

The main instrument to answer the research questions was a face-to-face interview structured through a quantitative questionnaire. Two surveys were conducted to apply the questionnaire in the same months (March and April) among urban dwellers in Valdivia, before and after the news media coverage of the HWC-event, in 2018 and 2019, respectively (Figure 5, letters e, f and g). The questionnaire consisted of sections to elicit the same attributes of 12 wildlife species (Figure 5, letter a); i. aesthetic and negativistic attitudes; ii. knowledge (perception) about the threatened status; ii. support elicitation through the money allocation and rating scale methods (Figure 5, letters b, c, d.1. and d.2, respectively); iii. questions about the HWC-event; and iv, socio-demographic characteristics (an English translation of the questionnaire is provided, Appendix 1).

4.3.2.1. Questionnaire design

A booklet with colorful pictures of the wildlife species and their scientific and common names was provided to the participants while answering the interview. In section i. for the aesthetic attitude, it was asked: "*could you please tell me what your initial reaction to each of the animals shown in the photographs is?"*. For the negativistic attitude, it was asked: "*how safe or afraid would you feel around each of the animals shown in the photographs in an encounter in the wilderness?"*. The answers were measured through a five-point ordinal rating scale ranging from "*very ugly*" (-2) to "*very attractive"* (2) and *very safe* (-2) to very afraid (2), for aesthetic and negativistic attitude, respectively (Liordos et al. 2017a; Knight 2008; Kellert and Wilson 1995; Kellert 1996; Espinosa-Molina et al. 2021; Espinosa-Molina and Beckmann 2022). Afterward, it was asked, "*According to your knowledge or perception, could you please tell me which species is threatened?*", being the answers yes (1) and no (0).

In section ii. the support was elicited using the money allocation and rating scale. For the money allocation, a fixed amount of money was given to every participant (12 bills, each with a value of 1000 Chilean Pesos, CLP) to be split among 12 wildlife life species (Gunnthorsdottir 2001; Meuser et al. 2009; Tisdell and Wilson 2004; Samples et al. 1986; Malhotra et al. 2017; Espinosa-Molina et al. 2021; Espinosa-Molina and Beckmann 2022). It was indicated to the participants that the money would be used to develop activities to protect/conserve the selected wildlife species.

For the rating scale, it was asked, "*How strongly do you support or oppose governmental protection of each animal?*" (Liordos et al. 2017a; Knight 2008; Espinosa-Molina et al. 2021; Espinosa-Molina and Beckmann 2022). The participant could choose different answers presented on a five-point ordinal rating scale ranging from "*strongly oppose it*" (-2) to "*strongly support it*" (+2). Afterward, the participant should indicate their support through each method, being registered by the interviewer. In section iv, only applied for the 2019 survey, it was asked, "*Were you aware of the event that took place last year* (2018) *in the "Rio Cruces wetland" where some individuals of South American Sea Lion attacked and killed Black-Necked Swan?*". If the answer was yes, the source of information was asked. Finally, in section v., the participant's socio-demographic characteristics were recorded, including; gender, age, monthly income, and education level.

4.3.2.2. Sampling protocol

The participants were urban dwellers addressed in public places in Valdivia. One of the authors pre-tested the questionnaire to highlight pitfalls. The survey was conducted in March and April 2018 and 2019, between the news media coverage of the HWC-event (Figure 5, letters f anf g), by University students (interviewers) trained by one of the authors (M. E-M.). To obtain a representative sample of Valdivia, random sampling was conducted. For more insides on the sampling protocol, please refer to Espinosa-Molina et al. (2021) and Espinosa-Molina and Beckmann (2022).

4.3.3.Wildlife species

Twelve native wildlife species from the study area were selected (Figure 5, letter a). The species selection criteria were based on threatened and endemic status, taxa belonging and interest of a local environmental NGO; "Río Cruces" research center (www.cehum.org). The same twelve wildlife species were used on both surveys (2018 and 2019). The species selected were: South American Sea Lion, SASL (Mammal - *Otaria flavescens*); Coypo, CYO (Mammal - *Myocastor Coypus*); Many-colored Rush-tyrant, MCRT (Bird – *Tachuris rubrigastra*), Spot-flanked Gallinule, SFG (Bird – *Gallinule melanops*); Coicoi Heron, CH (Bird – *Ardea cocoi*); Chiloe Wigeon, CW (Bird - *Mareca sibilatrix*); Barrio's Frog, BF (Amphibian – *Calyptocephalella gayi*); Freswater Crayfish, FWCF (Crustacean – *Varilastacus araucaninus*); Freshwater Pancora Crab, FWPC (Crustacean - *Aegla manni*); Freshwater Fish, FWF (Osteichthyes - *Cheirodon spp.*); and Common Garden Spider, CGSP (Arachnida – *Doliomalus spp.*).

4.3.4.Data analysis

Average and standard deviation values and ranks (based on the first statistic) were derived for the money allocation and rating scale values for the 12 wildlife species, for both surveys. Additionally, the same statistics were derived for aesthetic and negativistic attitudes. Finally, the percentage of knowledge (perception) of the threatened status of the South American Sea Lion, awareness of the HWC-event, and the source of information were derived.

To compare the support received by the South American Sea Lion with the other 11 wildlife species, between the money allocation and rating scale, before and after the HWC-event, a

Friedman ANOVA test (Friedman 1937; Field 2017), with a pairwise comparison (Dunn 1964), was conducted.

To identify differences between the values elicited from the attributes between 2018 and 2019, the Mann-Whitney U test (Mann and Whitney 1947; Field 2017) was selected. First, the support differences before and after the HWC-event were derived for the 12 wildlife species. Secondly, differences in the South American Sea Lion's aesthetic and negativistic values between 2018 and 2019 were assessed. Finally, support differences between participants aware and not of the HWC-event were examined for the money allocation and rating scale.

All data analyses were performed in IBM SPSS Statistics® (IBM Corp 2021) for Microsoft Windows®, and the data visualization was conducted in Microsoft PowerPoint® (Microsoft 2019).

4.4. Results

4.4.1.Socio-demographic characteristics

Two samples were obtained each year from the survey application. For the 2018 and 2019 surveys, 368 and 358 questionnaires were completed, respectively. The response rate was 60% (248 refusals) and 59% (211 refusals) for 2018 and 2019. The socio-demographic characteristics of both years are presented in Table 11. The female and male percentage is 51.36% and 47.55 % for 2018 and 50.14 % and 47.91 % for 2019. In both samples, age, and education level, the most frequent category was 21 – 30 years, and University or Technical education category. The monthly income had different categories between years, being 501,000 – 600,000 CLP and non (income) the most frequent for 2018 and 2019, respectively.

Table 11 Socio-demographic characteristics of the sample; chapter three, (n: 368) and 2019 (n: 359).

Gender			Age			Monthly income (CLP)			Education Level		
Categories	Percentage (occurrence)		Ranges	Percentage (occurrence)		Ranges	Percentage (occurrence)		Categories	Percentage (occurrence)	
	2018	2019		2018	2019		2018	2019		2018	2019
Female	51.36 % (189)	50.14 % (180)	16 – 20	5.98 % (22)	5.29 % (19)	None	17.39 % (64)	18.66 % (67)	Primary school	2.99 % (11)	0.28 % (1)
Male	47.55 % (175)	47.91 % (172)	21 – 30	26.63 % (98)	35.93 % (129)	Lower than 300.000	14.13 % (52)	11.42 % (41)	High school	28.80 % (106)	20.61 % (74)
			31 – 40	24.73 % (91)	20.06 % (72)	301.000 – 400.000	9.78 % (36)	9.47 % (34)	University or Technical	63.59 % (234)	75.21 % (270)
			41 - 50	19.29 % (71)	18.38 % (66)	401.000 – 500.000	14.40 % (53)	9.75 % (35)	Postgraduate	3.53 % (13)	1.95 % (7)
			51 – 60	13.04 % (48)	13.37 % (48)	501.000 – 600.000	17.66 % (65)	13.93 % (50)			
			61 – 70	8.70 % (32)	5.57 % (20)	601.000 – 700.000	11.96 % (44)	16.16 % (58)			
			71 - 80	1.09 % (4)	0 % (0)	701.000 – 800.000	7.88 % (29)	7.52 % (27)			
						801.000 – 900.000	2.17 % (8)	5.85 % (21)			
						More than 901.000	2.45 % (9)	5.57 % (20)			

a Values obtained from the last national census conducted in Chile (INE 2017). *Ranges do not sum up 100% due to not included categories (except gender).*

b Percentages for the sample data do not sum up 100% due to missing values.

4.4.2. Percentage of the sample aware of the HWC event and information source

From the 2019 sample, 66.57% (n: 239) of the participants were aware of the HWC-event. The source of the HWC-event, in descent order based on the occurrence of each category, was social media 43.88% (n: 104), conversations 20.68% (n: 49), television or radio 16.88 (n: 40), paper-based newspaper 14.35% (n: 34), and digital news 4.22% (n: 10).

Table 12 Descriptive statistics of studied variables; chapter three.

Support								
Wildlife species [a]	**2018** (n: 368)				**2019** (n: 358)			
	Money allocation [b] **(ranking)** [CI.]		**Rating scale** [c] **(ranking)** [CI.]		**Money allocation** [b] **(CLP) (ranking)** [CI.]		**Rating scale** [c] **(ranking)** [CI.]	
	x	*SD*	*x*	*SD*	*x*	*SD*	*x*	*SD*
MCRT	**2.945,65** (**1**) [2.756,40-3.134,90]	1.846,21	**1,34** (**1**) [1.27-1.42]	,72	2.181,56 (**1**) [2.087,69-2.275,44]	903,15	**1,08** (**1**) [1.03-1.13]	,46
SFG	**1.459,24** (**2**) [1.336,12-1.582,35]	1.201,03	**1,15** (**2**) [1.08-1.23]	,74	1.667,60 (**2**) [1.586,85-1.748,34]	776,84	**,99** (**2**) [.94-1.05]	,51
CH	**1.288,04** (**3**) [1.181,90-1.394,18]	1.035,43	**1,05** (**4**) [.97-1.14]	,83	1.620,11 (**3**) [1.544,22-1.696,01]	730,17	**,97** (**3**) [.91-1.02]	,53
CW	**1.239,13** (**4**) [1.119,85-1.358,42]	1.163,66	**1,05** (**5**) [.96-1.14]	,84	1.416,20 (**4**) [1.331,16-1.501,24]	818,18	,91 (**4**) [.84-.97]	,61
CYO	**1.133,15** (**5**) [1.019,84-1.246,47]	1.105,44	**,97** (**7**) [.88-1.07]	,95	1.195,53 (**5**) [1.115,00-1.276,06]	774,80	,73 (**5**) [.66-.81]	,74
SASL	**839,67 (6)** [729,81-949,54]	**1.071,73**	**,68 (11)** [.57-.79]	**1,08**	**715,08 (8)** [631,85-798,32]	**800,80**	**,48 (10)** [.38-.58]	**,94**
SASL [d]	**-**	**-**	**-**	**-**	**650,21** [547,05-753,36]	**816.33**	**,45** [.32-.57]	**,99**
SASL [e]	**-**	**-**	**-**	**-**	**866.67** [728.16-1.005,16]	**766.23**	**,57** [.43-.72]	**,81**
BF	**815,22** (**7**) [709,62-920,81]	1.030,11	**1,10** (**3**) [1,02-1,18]	,75	**790,50** (**6**) [717,26-863,75]	704,70	**,71** (**6**) [.63-.78]	,74
CT	**763,59** (**8**) [676,90-850,27]	845,62	**1,03** (**6**) [,94-1,11]	,82	**768,16** (**7**) [688,11-848,21]	770,16	**,65** (**7**) [.57-.72]	,76
FWF	**453,80** (**9**) [340,98-468,80]	679,03	**,79** (**8**) [,69-,89]	,98	**458,10** (**10**) [397,12-519,08]	586,66	**,55** (**8**) [.46-.63]	,81
FWPC	**404,89** (**10**) [340,98-468,80]	623,50	**,72** (**10**) [,62-,82]	,99	**351,96** (**11**) [297,59-406,32]	523,01	**,43** (**11**) [.34-.51]	,84
FWCF	**369,57** (**11**) [308,15-430,98]	599,13	**,77** (**9**) [,67-,86]	,91	**533,52** (**9**) [464,13-602,91]	667,57	**,57** (**9**) [.49-.65]	,77
CGSP	**282,61** (**12**) [220,07-345,15]	610,11	**,43** (**12**) [,32-,55]	1,15	**287,71** (**12**) [230.71-344.71]	548,40	**,16** (**12**) [.06-.26]	,99

Attitudes and knowledge (perception) towards the South American Sea Lion				
	2018 (n: 368)		**2019** (n: 358)	
Variables	**x** (*SD*) [C.I.]	min & max	**x** (*SD*) [C.I.]	**min / max**
Aesthetic (ATH) [f]	**-,12** (*1,12*) [-,24 – (-),01]	-2 / 2	**-,54** (*1,04*) [-,65- (-),44]	-2 / 2
Negativistic (NEG) [g]	**,43** (*1.07*) [-,32 – (-),54]	-2 / 2	**,94** (*,89*) [,85- 1,03]	-2 / 2
Knowledge (perception) of the threatened status	**Yes**: 32,07 % (n: 118)	**No**: 67,93 % (n: 250)	**Yes**: 39,83 % (n: 143)	**No**: 59,61 % (n: 214)

a. MCRT: Many-colored Rush-tyrant (*Tachirus rubigstra*); SFG: Spot-flanked Gallinule (*Gallinula melanopis*); CH: Coicoi Heron (*Ardea coicoi*); CW: Chiloe Wigeon (*Mareca sibilatrix*); CYO: Coypo (*Myocastor coypus*); SASL: South American South American Sea Lion (*Otaria flavescens*); CT: Chilean Toad (*Calyptocephalella gayi*); BF: Barrios Frog (*Insuetophrynus acarpicus*); FWCF: Freshwater Crayfish (*Varilastacus araucanis*) FWPC: Freshwater Pancora Crab (*Aegla manni*); FWF: Freshwater Fish (*Cheirodon spp.*); CGSP: Common garden spider (*Doliomalus spp.*).

b. Values ranging from 1,000 to 12,000 CLP (Chilean Pesos). It must be noticed that usually, the maximum amount received for the most supported wildlife species was around 3,000 CLP, by each participant.

c. Values ranging from -2 to +2, "strongly oppose for governmental protection" and "strongly support governmental protection," respectively.

d. Average values only considering participants aware of the "South American Sea Lion Event" (n: 244).

e. Average values only considering participants not aware of the "South American Sea Lion Event" (n: 120).

f. Answers values ranging from -2 to +2, very ugly to very attractive, respectively, from the question "…could you please tell me what your initial reaction would be to this animal (South American South American Sea Lion) shown in the photograph is?...".

g. Answers values ranging from -2 to +2, very safe to very afraid, respectively, from the question "…how relaxed or afraid would you feel around the animals (South American South American Sea Lion) shown in the photograph in an encounter in the wilderness?...".

4.4.3. Support differences; money allocation and rating scale, towards the South American Sea Lion, and within other wildlife species, before and after the HWC event

After the HWC-event, based on the average values, the support toward the South American Sea Lion decreased for the MA, from CLP 839.67 to CLP 715.08, and the rating scale from 0.68 to 0.48 (Table 12). It must be noted that all wildlife species presented a decrease in support based on the average values for the rating scale, while for money allocation, some wildlife species have an increase and decrease from 2018 to 2019 (Table 12). Furthermore, based on the Mann-Whitney U test (for test results details, please refer to Appendix 2), for the rating scale, all wildlife species have a statistically significant (indicated by a start) decrease in support after the HWC-event, including the South American Sea Lion (Figure 6, dotted black line). In the money allocation, the South American Sea Lion does not have a statistically significant support difference from one year to another. Interestingly, once the sample after the HWC-event was split between participants aware and not of the HWC-event, the Mann-Whitney U test results identified a statistically significant difference based on the money allocation between the two groups of participants [participants aware (mean rank: 166.86) and not aware (mean rank: 197.98) (U = 11272.000, Z= -2,928, p =,003)]. On the contrary, the rating scale did not identify a statistically significant difference, between the two participants groups, for the rating scale [participants aware (mean rank: 174.07) and not aware (mean rank: 184.63) (U = 12923.000, Z= -.982, p = 0.326)].

Differently, when comparing the support received by the South American Sea Lion with the other 11 wildlife species, a different interpretation of the results arises. Based on the average values, the South American Sea Lion, descent two positions according to the money

allocation; in contrast, the species ascent one position in the rating scale case (Table 12). Furthermore, the results of the Friedman's ANOVA test indicate a significant difference in the support among the wildlife species for rating scale, X^2 *(11) 580.839,* $p < .001$, and money allocation, X^2 *(11) 1222.819,* $p < .001$ for 2018, and rating scale, X^2 *(11) 908.715,* $p < .001$ and money allocation, X^2 *(11) 1559.842,* $p < .001$, for the year 2019 (for test results details, please refer to Supplement material S3). Figure 7 shows the support elicitation by the money allocation and rating scale before and after the HWC-event (2018 and 2019 block, respectively). Each block is integrated by subsets, representing groups of wildlife species without statistically significant differences in the support received among them. Based on the money allocation, the South American Sea Lion stayed in the eighth position from one year to another (Figure 7, upper blocks). After the HWC-event (Figure 7, upper 2019 block), the South American Sea Lion was grouped in lower-ranked subsets compared to 2018 (Figure 7, upper 2018 block). According to the rating scale, the South American Sea Lion kept the tenth position from one year to another (Figure 7, lower blocks). Unlike the money allocation, the South American Sea Lion was in higher support of wildlife species subsets after the HWC-event, based on the rating scale (Figure 7, lower 2019 blocks).

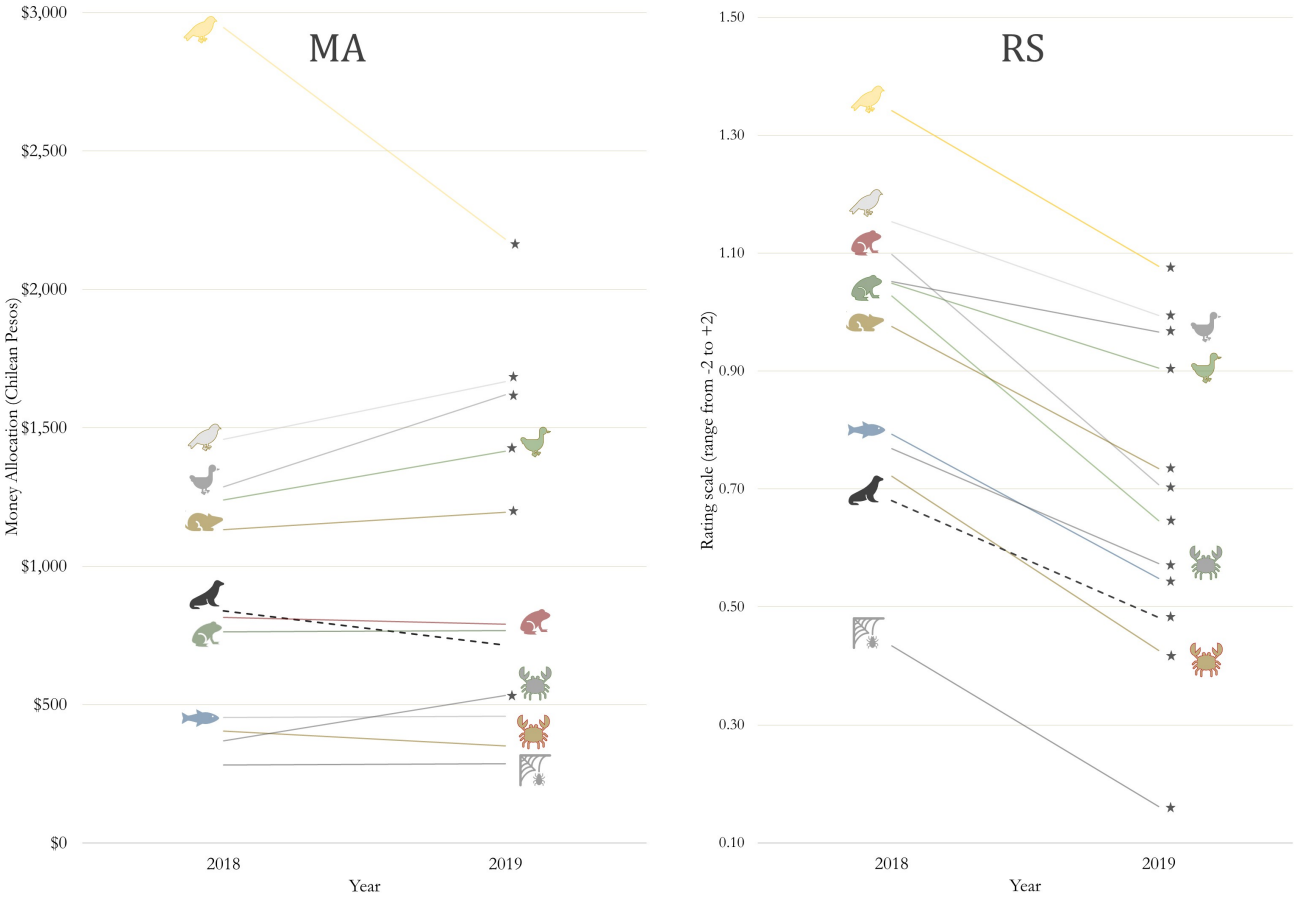

Figure 6 Support elicited by two methods, money allocation (MA) and rating scale (RS), between 2018 and 2019 for 12 wildlife species. For the MA a total of 12,000 Chilean pesos were distributed among the wildlife species. For the RS each wildlife species was rated independently in a scale ranging from -2 (*strongly oppose governmental protection*) to +2 (*strongly support governmental protection*).

- Many-colored Rush-tyrant (*Tachirus rubigstra*)
- Spot-flanked Gallinule (*Gallinula melanopis*)
- Coicoi Heron (*Ardea coicoi*)
- Chiloe Wigeon (*Mareca sibilatrix*)
- Coypo (*Myocastor coypus*)
- South American Sea Lion (*Otaria flevescens*)
- Chilean Toad (*Calyptocephalella gayi*)
- Barrios Frog (*Insuetophrynus acarpicus*)
- Freshwater Fish (*Cheirodon spp.*)
- Freshwater Crayfish (*Varilastacus araucanis*)
- Freshwater Pancora Crab (*Aegla manni*)
- Common garden Spider (*Doliomalus spp.*)

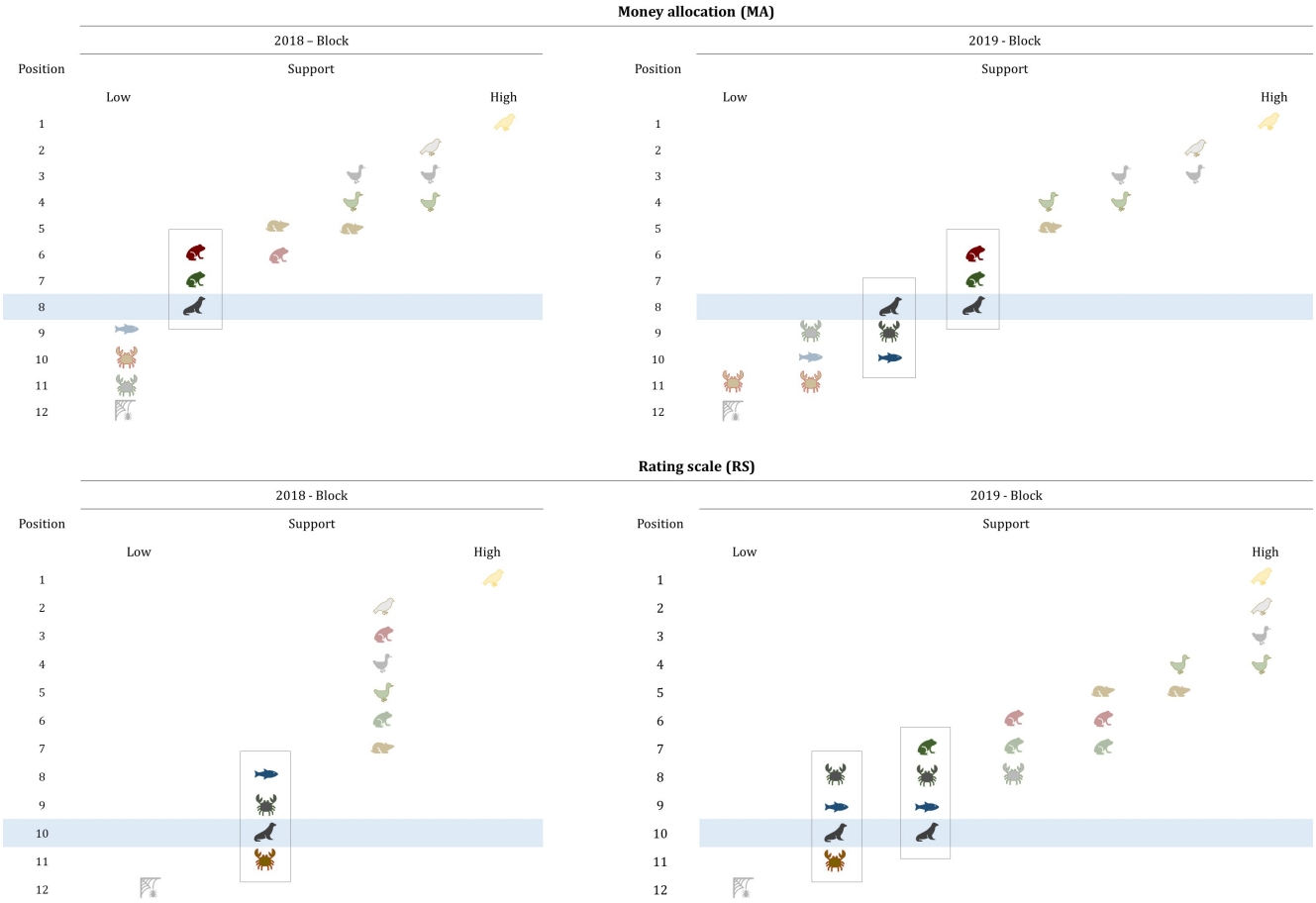

Figure 7 Groups of wildlife species (columns) based on the received support by two methods, money allocation and rating scale, as assessed by a pairwise post hoc Dunn-Bonferroni test after significant Friedman's ANOVA ($p < .05$). Both methods were elicited before (2018) and after (2019) a mass media coverage of a human-wildlife conflict event, involving a South American Sea Lion population in south Chile. The figures of the wildlife species correspond to:

- Many-colored Rush-tyrant (*Tachirus rubigstra*)
- Spot-flanked Gallinule (*Gallinula melanopis*)
- Coicoi Heron (*Ardea coicoi*)
- Chiloe Wigeon (*Mareca sibilatrix*)
- Coypo (*Myocastor coypus*)
- South American Sea Lion (*Otaria flevescens*)
- Chilean Toad (*Calyptocephalella gayi*)
- Barrios Frog (*Insuetophrynus acarpicus*)
- Freshwater Fish (*Cheirodon spp.*)
- Freshwater Crayfish (*Varilastacus araucanis*)
- Freshwater Pancora Crab (*Aegla manni*)
- Common garden Spider (*Doliomalus spp.*)

4.4.4. Differences in participants´ aesthetic and negativistic attitudes and knowledge (perception) about the South American Sea Lion's threatened status.

After the news media coverage of the HWC-event, the South American Sea Lion was perceived uglier or less attractive, and participants felt more afraid of an encounter in the wilderness, based on the average and confidence of intervals values received for the aesthetic and negativistic attitudes (Table 12). The aesthetic attitude decreased from -0.12 to -0.54, and the negativistic attitude increased from 0.43 to 0.94 (Table 12). The Mann-Whitney U test identified a statistically significant decrease for the aesthetic attitude [before; mean rank = 401.50; and after; mean rank= 324.44, the HWC event; (U = 51887.500, Z= -5.149, $p < .001$)] and increase of the negativistic attitude [before; mean rank = 313.71; and after; mean rank= 415.55, the HWC event; (U = 84562.500, Z= 6.961, $p < .001$)], after the HWC event. Finally, the percentage of people who were convinced or perceived the South American Sea Lion as threatened increased from 32.07 % to 39.83 % after the HWC-event (Table 12).

4.5. Discussion

Firstly the main results of the attributes changes for the South American Sea Lion after the news media coverage of the HWC-event will be briefly contrasted with similar research methods frameworks. Later the findings related to the news media's role in the human-wildlife dimension will be discussed. Also, the differences between the money allocation and rating scale to assess support changes will be reviewed. Following certain limitations of the money allocation method will be mentioned. Finally, some concluding remarks and possible implications for the money allocation method in the human dimension of natural resource management research field will be noted.

4.5.1. Main results

After the HWC-event, the South American Sea Lion decreased in support based on the average money allocation and rating scale values, but only the last was statistically significantly lower (Table 12 and Figure 6). However, when splitting the sample between participants' awareness and not of the HWC-event, the money allocation identified a statistically significant difference among the two groups, where participants not being aware of the HWC-event presented higher support for the South American Sea Lion (Mann-Whitney U test results; section 4.4.3).

Regarding the support attribute, overall, there is more evidence of longitudinal studies in the human-wildlife interaction research field using the rating scale method than the money allocation (Whitehouse-Tedd et al. 2020). For example, in the United States of America; the general public attitudes were assessed, through a rating scale (specifically asking the

participants if they liked or disliked certain wildlife species), towards the same 26 wildlife species in 1978 and 2014, with no significant differences between surveys (George et al. 2016). Contrarily, Niemiec et al. (2022) identified significant changes in general public beliefs, measured with a rating scale, on a survey applied in 2020 before and after a ballot initiative to reintroduce wolves into Colorado, United States of America. Similary Majić et al. (2011) identified a significant difference in answers related to the increment, management, and hunting permission towards the brown bear in Croatia (*Ursus arctos*) given by dwellers between 2002 and 2008. On the other hand, Basak et al. (2022) elicited attitudes towards urban wildlife species among Krakow (Poland) residents in 2010 and 2020, identifying significant changes but with an overall small effect size.

Regarding the aesthetic and negativistic attitudes, after the news media coverage of the HWC-event, participants found the South American Sea Lion less attractive and were more afraid of an encounter in the wilderness. To our knowledge, no studies have assessed differences in the aesthetic and negativistic attributes in a longitudinal study. Even so, the relation between support and aesthetic and negativistic attitudes have been studied for decades; generally being a positive and negative one, respectively, the same as the results here presented (Liordos et al. 2017a; Gunnthorsdottir 2001; Kellert 1996; Espinosa-Molina et al. 2021; Liordos et al. 2021; Jaunky et al. 2021; Kellert 1982). Finally, there was an increment in the percentage of participants who assessed the South American Sea Lion as threatened after the news media coverage of the HWC-event. The South American Sea Lion, since the years 2013 and 2016, has been classified as "Least Concern" by the Chilean government and the IUCN red list of threatened species™, respectively (IUCN 2016; National inventory of Chilean species 2013). This misperception of the threatened status by the participants is consistent with previous findings. Courchamp et al. (2018) identified that science university

students' knowledge of the threatened status of the ten most cherished species was surprisingly low. In the same direction, Majić et al. (2011) did not identify a difference in the relative bear knowledge among dwellers in a survey conducted between 2002 and 2008. Probably, the increase in the misperception of the South American Sea Lion's threatened status by the participants could be correlated, to a greater extent, with a taxonomic bias, i.e., where mammal and bird species are perceived with more conservation priorities over other taxa species than with the current threatened status (Espinosa-Molina et al. 2021).

4.5.2.Mass media effect

More than half of the participants (n: 239, 66.57%) of the 2019 survey were aware of the HWC-event, being mass media, i.e., social media, television or radio, paper-based newspaper, and digital news the source.

Similar research, i.e., the mass media role in human-wildlife dimension, has had a different target, not being straightforward to contrast with our results. Previous research studies have focused on how content or news media are presented or framed to the consumer (Houston et al. 2010; Mammola et al. 2020; Toivonen et al. 2019; Nanni et al. 2020; Bombieri et al. 2018) and how the content is correlated with attitudes or behaviors towards wildlife species (Ballejo et al. 2021; Correia et al. 2021; Fidino et al. 2018). Differently, the present research study assesses the changes in attitudes, behaviors, and knowledge about the South American Sea Lion after a news media coverage of an HWC-event. We are unaware of a similar research method framework, but a study by Arbieu et al. (2019) has certain resembles. They identify that German inhabitants have more tolerant attitudes towards wolves recolonization if their source of information about the species comes from books and films. Oppositely, if the

source of information came from the press or TV news, the attitudes tend to be more negative. A justification of this last could be based on the findings by Nanni et al. (2020), where large vertebrates as mammals are subject to sensationalistic news media coverage (Nanni et al. 2020). Additionally, previous findings have identified a negative correlation between general public attitudes or behaviors and large vertebrates involved in an HWC-event news media (Ballejo et al. 2021; Correia et al. 2021; Fidino et al. 2018). Although it is not possible to empirically prove causality between the decrease in support (MA) after the news media coverage of the HWC-event, and an increment and decrease in negativistic and aesthetic attitudes towards the South American Sea Lion, based on the available evidence, it would be plausible to infer it.

4.5.3. Differences between money allocation and rating scale to assess support changes over time

The money allocation and rating scale differ in several traits; the objective of their inception, methodology to be applied, unit used, data analysis, and interpretation, among other characteristics (for further information, refer to Malhotra et al. 2017). Below will be discussed two traits or differences between the money allocation and rating scale, i.e., their comparative and non-comparative scales characteristics (Malhotra et al. 2017) and an "interview effect,"; highlighting its implications for interpreting the results. Additionally, an alternative to interpreting the results by comparing the values received among the other 11 wildlife species will be explained. Finally, to better comprehend the following points, it is helpful to remember that the support was elicited by the two methods, money allocation and rating scale, with the same participant.

4.5.3.1. Money allocation and rating scale, comparative and non-comparative scales

The money allocation and rating scale can be differentiated based on their scaling technique (Malhotra et al. 2017). This last means, in the money allocation case, the support towards one wildlife species will depend on the support given to the other 11 species. In the rating scale case, each wildlife species receives support independently of the value given to the other species. In the present research design structure, for the money allocation, if a participant allocates one bill to a wildlife species, it also implies that the other 11 species will not receive that same bill. In the case of the rating scale, the value selected from the scale given to a wildlife species does not compromise to provide the same value to the others 11 species. An advantage of the money allocation method, or "constant sum scaling" (Malhotra et al. 2017), is the ability to reveal participants' relative importance among several attributes. Through a money allocation method, researchers from applied marketing can simulate shopping mall conditions, aiming to identify consumers' preferences among similar products (Malhotra et al. 2017). Differently, the rating scale was conceived and generally used, e.g., a Likert-type scale, to classify a person's attitudes toward a statement (Likert 1932; Coolican 2014; Malhotra et al. 2017). Having an attitude towards an object (here, wildlife species) does not restrict having another attitude toward another object.

The following is a direct implication in our data due to comparative and non-comparative scale differences. In the case of the money allocation method, the amount of money received by the wildlife species is the same from one year to another. In the rating scale method, the values received among the wildlife species can vary within the rating scale range. For example, if we compare the confidence interval of the same position (rank) from one year to another (Table 12, values between round and square parenthesis), independently of the wildlife species, all rating scale ranges after the HWC-event are more negative than for the 2018 sample. On the other hand, in the same case for the money allocation, while some wildlife species' confidence intervals get negative, others get positive from one year to another. This difference between the two methods, together with an "interviewers effect" (described below), could explain the negative trends of support for all wildlife species, including the Southe American Sea Lion, based on the rating scale method (Table 12 and Figure 6).

4.5.3.2. Negative support trend for all wildlife species based on the rating scale method due to its scaling characteristic and an interview effect.

A disadvantage of face-to-face interviews is the social desirability bias (Malhotra et al. 2017; Coolican 2014; Boardman et al. 2017). The social desirability bias has been described as the tendency to give answers based on what the interviewee believes would be socially accepted or what the interviewer would expect (Coolican 2014). When applying a rating scale through a face-to-face interview, answers by the participants tend to be more positive than in reality (Coolican 2014). In our data, the rating scale answers after the HWC-event could have been affected by the social desirability bias, but the participants, overall, instead of giving more

positive answers, were given more negative ones, closer to the -2 extreme; "*Strongly oppose it (governmental protection of each animal)"*. This last could be sustained by the following. The interviewer's team used for the data collection before and after the HWC-event differed. Before the HWC-event, one team was composed of three interviewers and two after the HWC-event. Despite having trained the interviewers with the same protocol, probably the style of how the interview was applied between teams may have differed enough, where participants gave more negative answers than participants before the HWC-event. Due to the non-comparative characteristics of the rating scale method, the values for all wildlife species after the HWC-event become more negative from one year to another, including the South American Sea Lion. Thus, comparing one year to another is relatively straightforward based on the money allocation method, while for the rating scale method is more complex. A potential alternative to overcome this would be to compare the values received among the wildlife species.

4.5.4. Identifying the South American Sea Lion support trend by comparing it with other wildlife species.

After the HWC-event, the South American Sea Lion presented a decrease in support based on its average values for the money allocation and rating scale. On the other hand, when the position of the wildlife species (based on the average values of support) is compared to each other, for the South American Sea Lion, there is a descent and ascent; based on the money allocation and rating scale methods, respectively (Figure 7). Valuating a wildlife species set allows the participant to use the other species as references or benchmarks to value among them, also known as "carryover effect" (Malhotra et al. 2017). Based on the wildlife species position (Table 12 values between brackets), the South American Sea Lion descent two

positions based on the money allocation; from six to eight after the HWC-event. In the same case for the rating scale, the South American Sea Lion ascends from the 11th to the 10th position. On the other hand, the subsets from the Friedmans ANOVA test give us a different perspective to interpret the results (Figure 7). The blocks from one year to another can differ in the number of subsets and the position they may take on the horizontal axis. Oppositely, a constant between years is the number of places a wildlife species can occupy in the vertical axis, which in the present study case is 12 (number of wildlife species).

Therefore, a way to compare a support increase or decrease for the South American Sea Lion (or any other of the 11 wildlife species) would be through the position occupied on the vertical axis (from 1 to 12) and the other wildlife species' position with whom the South American Sea Lion shares subsets. For example, for the money allocation, the South American Sea Lion has the eighth position in both years. Before the HWC-event is in one subset with the sixth and seventh most supported species; Barrios Frog and Chilean Toad, respectively (Figure 7, MA; 2018 block). After the HWC-event, the South American Sea Lion, besides being in the same subset, is also in a subset with the ninth and tenth most supported species; Freshwater Crayfish and Freshwater Fish, respectively (Figure 7, MA; 2019 block). This last could suggest a support decrease for the South American Sea Lion after the news media coverage of an HWC-event.

Oppositely, in the rating scale case, the South American Sea Lion is in the tenth most supported position before and after the HWC-event. Before the HWC-event, this species is grouped with the eighth, ninth and eleventh most supported species; Freshwater Fish, Freshwater Crayfish and Freshwater Pancora Crab, respectively (Figure 7, rating scale; 2018 block). After the HWC-event, besides being in the same subset, it is in another with the seventh, eighth, and ninth most supported species; Chilean Toad, Freshwater Crayfish, and

Freshwater Fish, respectively (Figure 7, rating scale 2019 block). Thus, for the rating scale, the difference between subsets before and after the HWC-event could be interpreted as a support increase for the South American Sea Lion.

4.5.5.Limitations of the money allocation method

The following are limitations identified in the present research study to measure support changes through the money allocation method. Suppose an aim would be to elicit support for the same wildlife species over time. In that cas it is strictly necessary to keep the same wildlife species set, i.e., not taking or including any other wildlife species (Malhotra et al. 2017). In addition, the data produced by the money allocation method should be considered ordinal; therefore, the values cannot be generalized beyond the research study context (Malhotra et al. 2017). Another possible disadvantage of the money allocation method is that the participant does not have the choice to allocate a lower amount of money than is given to the set of wildlife species; in the present study, 12 bills of 1,000 CLP for 12 species. Therefore is not possible to distinguish whether the participant, when placing a bill on a wildlife specie, does it to support it or does not want to support other species. An implication could be that one species could be over-supported. For example, in our data, the MCRT is the most supported wildlife species, with a difference of 1486,41 and 513 CLP, for 2018 and 2019 respectively, with the following species the highest support difference among the 12 species (Table 12). Thus, the values obtained by the highest supported wildlife species could be overestimated.

4.5.6.Concluding remarks

Our results showed a shift in the human-wildlife interactions between the South American Sea Lion and urban dwellers after a massive news media coverage of an HWC-event. Regarding the money allocatoin and rating scale methods, both were capable of eliciting support towards the 12 wildlife species, including the South American Sea Lion, and presumably using less time and technical resources than most methods to measure wildlife species support, e.g., the Likert-type scale (Bath et al. 2022; Whitehouse-Tedd et al. 2020) and traditional Contingent Valuation Methods (Champ et al. 2017; Atkinson et al. 2018). Additionally, both methods presented considerable differences, which should be taken into account when choosing a method to measure support towards wildlife species over time. Based on our results, the money allocation displayed certain advantages over the rating scale method. The money allocation is a method which "…*allows finer discrimination among stimulus objects without requiring too much time*…" (Malhotra et al. 2017, p. 346), thus useful in cases where the participants, here urban dwellers, do not have a direct relationship or poor knowledge of the wildlife species of evaluation (Tisdell and Wilson 2004). Additionally, the money allocation was less susceptible to the social desirability bias (Coolican 2014; Malhotra et al. 2017), than the rating scale due to the comparative scale characteristics of the money allocation (Malhotra et al. 2017).

4.5.7. Implications of the money allocation in the Human dimension of natural resource management.

The money allocation method could represent a plausible alternative to measure wildlife species support changes in a longitudinal research design structure. Additionally, it has been recommended that the impact of conservation initiatives on the general public should be measured by changes in human behaviors, a characteristic of the money allocation method (Nilsson et al. 2020). Despite this, further evidence to generalize our results will be needed, e.g., applying the same research design structure in different social-ecological contexts. The money allocation could represent an effective method to assess wildlife species support changes by comparing the position of a human-wildlife interaction within the conflict-to-coexistence continuum over time (Figure 1, letters I, j and k). The correlation between support and attitudes, knowledge, and socio-demographics has been studied. Therefore, the money allocation method could be used as a proxy of a human-wildlife interaction state to assess support changes over time. Once identifying the support trend over time, it would be possible to determine whether support is decreasing and, if so, e.g., through a qualitative approach, study in depth the human-wildlife interaction, aiming to resolve the conflict.

5. Main results, concluding remarks, outlook and research guidelines

5.1. Main results

Both methods, i.e., money allocation and rating scale, could assess support changes towards the wildlife species after information disclosure (chapters 2 and 3). The money allocation could group the wildlife species based on shared ecological traits, i.e., threatened and endemic status, after being disclosed to the participants. Differently, the rating scale did not have the same results (chapter 2).

After the information exposure, i.e., news media coverage of an HWC-event, the South American Sea Lion experienced a decrease in support from 2018 to 2019, based on the average values for the money allocation and rating scale. On the other hand, when splitting the sample between participants aware and not of the HWC-event, only the money allocation identified a significant difference; participants not being aware of the event presented higher support towards the South American Sea Lion. Furthermore, when the South American Sea Lion's position (based on the average values of support) is compared with the other 11 wildlife species, there is a descent and ascend based on the money allocation and rating scale, respectively (chapter 4).

This difference between the two methods can be explained to a certain extent due to their scaling techniques characteristics, i.e., their comparative and non-comparative characteristics (Malhotra et al. 2017). The money allocation is a comparative scale; therefore, the support given to one wildlife species will affect the possible support given to the other species included in the set. In contrast, the rating scale is a non-comparative scale, i.e., the support given to a wildlife species is independent of the support given to the other wildlife species in the set. In both research design structures, i.e., experimental and longitudinal, the before-

mentioned difference between the methods could explain the results to a certain degree. In the experimental research design structure (chapters 2 and 3), after disclosing the threatened and endemic status, the money allocation method grouped wildlife species based on shared ecological characteristics because participants needed to choose which wildlife species to support, i.e., to give or increase support to a threatened or endemic wildlife species a bill should be taken from another wildlife species, usually not threatened nor endemic. On the contrary, in the rating scale, there was no need to choose; the support could be increased for a wildlife species without decreasing the support for other wildlife species. On the other hand, the scaling technique characteristics in the longitudinal study design structure could have had the following impact. In the money allocation method, the possible amount of support to be given to a wildlife species, i.e., 12 bills of 1,000 CLP each, did not vary from 2018 to 2019. On the other hand, under the same situation for the rating scale, the values received among the wildlife species can vary within the rating scale range. In other words, the minimum and maximum values of the support range for each wildlife species can change from one year to another. Therefore, comparing one year to another is not as straightforward as with the money allocation method.

5.2. Concluding remarks

Based on the results of our proposed objectives, we identify differences between the money allocation and rating scale to elicit support toward wildlife species and assess support changes in both research design structures, experimental and longitudinal (Charter 2-3 and 4, respectively).

The money allocation method presented advantages over the rating scale to assess support changes towards wildlife species. The money allocation determined support changes among the wildlife species more precisely than the rating scale. Additionally, eliciting support towards a set of wildlife species through one question was easy to understand and follow by the participant. The set of wildlife species also helps the participant to value one wildlife species using the other species in the set as a reference, also known as carryover effect (Malhotra et al. 2017). Also, the set of wildlife species facilitates the participant to evaluate when there is no direct relationship or poor knowledge of the wildlife species or valuation object (Tisdell and Wilson 2004). Finally, the money allocation method, when applied, i.e., data collection and analysis, requires less time and trained personnel compared to other approaches to elicit support towards wildlife species; e.g., Likert-type scale (Whitehouse-Tedd et al. 2020; Majić and Bath 2010) or traditional Contingent Valuation methods (Champ et al. 2017; Atkinson et al. 2018).

These advantages may rely on the conception and usage of the money allocation method. The money allocation was conceived in the Economic field, being a technique under the principles of the theory of consumer choice, i.e., participants must choose. Due to this last, the money allocation method "…*allows a fine discrimination among the stimulus objects without requiring too much time*…" (Malhotra et al. 2017, p. 346).

Even so, it will be necessary to replicate the presented research design structure, or parts of it, in different socio-ecological contexts to extrapolate conclusions beyond the study context presented here.

5.3. Outlook: Monitoring human-wildlife interactions through the money allocation method.

The money allocation is a relatively simple quantitative method to be applied, therefore being a plausible alternative to monitor human-wildlife interactions, i.e., to position and visualize support shifts within the conflict-to-coexistence continuum (Frank et al. 2019). Monitoring human-wildlife interactions through a quantitative method could represent certain advantages for managing human-wildlife interactions. For example, this method could be used to position any type of human-wildlife interactions, not only ongoing HWC, due to the low resources needed to be implemented. Position as much as possible specific human-wildlife interactions could allow identifying or "unmask" underlying HWC or spotting potential conflicts. For example, human-wildlife interactions in urban areas are not very much considered by conservation practitioners, as generally, ongoing conflicts involving large vertebrates occurring in the countryside draw most of the attention.

Most approaches to assess human-wildlife interactions have been developed to resolve ongoing HWCs, generally involving large-sized mammals (Kansky et al. 2016; Kansky et al. 2021; König et al. 2020; König et al. 2021; Morzillo et al. 2014; Crespin and Simonetti 2019; Denninger Snyder and Rentsch 2020). A collateral effect of meanly putting efforts into resolving ongoing conflicts this last is the neglection of other taxa species that can be subject

to potential or underlying HWC, e.g., birds, reptiles, amphibians, and invertebrates (König et al. 2020; König et al. 2021; Denninger Snyder and Rentsch 2020). Identifying potential HWCs, e.g., a negative trend of support towards a wildlife species population, would allow managing them to prevent becoming an established HWC (Karanth and Vanamamalai 2020; Cusack et al. 2021). Similarly, detecting underlying HWC could also give the chance to manage the situation before the wildlife species population become extinct in a specific area. Additionally, in both cases, identifying potential and underlying HWC would save resources, pecuniary and non-pecuniary, compared to managing established HWC (Ceauşu et al. 2019). It is not feasible to reach human-wildlife coexistence by only focusing on conflicts.

Furthermore, most methods to assess HWC do not consider the indirect impacts of a conflict on target groups (e.g., urban dwellers) beyond the human-wildlife events occur (Catapani et al. 2021; Frank et al. 2019; Woodroffe et al. 2005; Cusack et al. 2021). It is necessary to include this target group since a correlation has been suggested between negative attitudes towards wildlife species involved in an HWC-event with mass media coverage and people consuming the mass media news (Arbieu et al. 2019; Ballejo et al. 2021).

Finally, approaches to evaluating HWCs are primarily qualitative (Newing 2010; Frank et al. 2019; Marchini et al. 2021). A qualitative approach has advantages such as disclosing unique and detailed information about a case study, i.e., a specific HWC-event (Newing 2010). Nonetheless, the resource needed and high technical preparation by the person or team conducting the study makes it very difficult to apply it on a broader scale.

Therefore, the money allocation method could function as an overview of human-wildlife interactions in a specific area, working as a first assessment. For example, the money

allocation could be applied over time in the same area over the same wildlife species set. Once a negative support trend of a wildlife species is spotted, a qualitative method to have a deep understanding of the conflict, therefore, be able to manage it, could be applied.

5.4. Research guidelines; further research for the money allocation to be applied as a monitoring method for human-wildlife interactions

Based on the gained experience while conducting the dissertation, two general research guidelines were identified for the money allocation as a methodology to monitor human-wildlife interactions between specific wildlife and human populations.

Firstly, it would be necessary to continue assessing to which extent the money allocation measurement represents, and also to which extent does not represent, a proxy of human-wildlife interactions. It is not the objective to evaluate or classify human-wildlife interactions through one attribute. Instead, the aim is to use the money allocation as a "first line" assessment for human-wildlife interactions. To this aim, it could be recommended to continue identifying the variety of attributes that the support attribute could represent or have a direct relation to, e.g., knowledge about and attitudes towards wildlife species and sociodemographic characteristics (Liordos et al. 2020; Liordos et al. 2017a; Knight 2008; Espinosa-Molina 2019; Espinosa-Molina et al. 2021). Equally or even more essential would be to identify the limitations of the support attribute and identify which attributes the support could not predict.

The second research guideline would aim to modify the sampling method from a face-to-face interview to an online one. In the present dissertation, we have used a face-to-face

interview for the following reasons. First, face-to-face interviews are usually conducted in developing countries because mail or telephone surveys are ineffective (Bush and Prather 2019). Secondly, face-to-face interviews can achieve response rates that are not possible to accomplish with other survey methods (Malhotra et al. 2017). Therefore, a face-to-face interview was chosen due to the high response rate to have enough data to answer the dissertation research questions. After testing the method and answering the proposed research questions, the sampling method could change to an online self-administered questionnaire keeping the same research design structure of the dissertation. It has been stated that the potential interviewers' bias is reduced to "none" through an online survey (Malhotra et al. 2017). This last would be interesting to consider since our data most likely was affected by this "interviewer bias" (Malhotra et al. 2017; Coolican 2014). Secondly, it would consume less time compared to the face-to-face interview. In the present dissertation, each interview, from the first approach with the participants until the interview was finished, took, on average, 20 minutes. This interview length is exceptionally long compared to the three minutes duration recommended in a face-to-face interview when random people are stopped in the street (Newing 2010). In the same line, the dissertation interview used several interactive materials, translating into a relatively complex interview to apply. Therefore an online survey would allow an interactive questionnaire without too much effort when applied. Finally, an online survey would allow to replicate as many times as necessary the data gathering, without increasing the cost compared to a face-to-face interview. As the aim of the money allocation method is to monitor human-wildife interactions, a method easy to replicate becomes fundamental.

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Appendix

Appendix 1 Questionnaire applied for the survey.

Complete English version of the questionnaire used to conduct the interview. The numbers indicated the questions and the cursive letter indicates the speech conducted by the interviewer.

Excuse me, I'm doing a survey in which only your opinion is asked and nothing in return, having an approximate duration of 15 minutes. If you could answer the survey, you will be participating in a "Gif card" for CLP 50,000 in Jumbo (local grocery store). *At the end of the interview you will be given a number with the instructions, to know if you are the winner and how to exchange the prize.*

If the person accepted, the interview was started.

The following survey aims to understand the relationship between the urban population of Valdivia and the animal wildlife that inhabits the River "Cruces" wetland. It is conducted by a Valdivian researcher, in order to obtain his Doctor degree, with the collaboration of the "Centro de Humedales del río Cruces". It is expected that the results of the present study will allow, among other things, to design strategies to obtain the support of the citizenship for the conservation of wildlife animals (it must be noted that the term animal was used during the interview to refer to a species). *Your anonymity will be guaranteed. You will not be asked any information with which it could be possible to reach you. The information collected will be used to write a Master dissertation, and possibly publish the results in a scientific journal.*

1. Number of survey ___
2. Date ___
3. Name of the interviewer ___
4. Area of the interview ___

The animals shown in the photographs are native. This means they have been living naturally in Chile and it is believed they originated or came naturally to the country, without human intervention. All these animals can be found in the river "Cruces" Wetland. I'm going to ask you some questions and I just need your opinion, there are no right or wrong answers. Please notice it is only possible to give one answer to each question.

5. Aesthetic attitude

Could you please tell me, which is your initial reaction to each of the animals shown in the photographs? The possible answers are: very ugly, ugly, neither ugly nor attractive, attractive and very attractive.

Specie	Very ugly	Ugly	Neither ugly nor attractive	Attractive	Very attractive
Sp. A					
Sp. B					
Sp. C					
Sp. D					
Sp. E					
Sp. F					
Sp. G					
Sp. H					
Sp. I					
Sp. J					
Sp. K					
Sp. L					

6. Negativistic attitude

Could you please tell me, how safe or afraid would you feel around each of the animals shown in the photographs in an encounter in the wilderness? The possible answers are: very safe, safe, neither safe nor afraid and very afraid.

Specie	Very safe	Safe	Neither safe nor afraid	Afraid	Very afraid
Sp. A					
Sp. B					
Sp. C					
Sp. D					
Sp. E					
Sp. F					
Sp. G					
Sp. H					
Sp. I					
Sp. J					
Sp. K					
Sp. L					

7. Section 1

Round 1: Two methods to elicit the support towards wildlife species providing colorful pictures, and scientific and common names of the wildlife species.

7.1. Money allocation

You have CLP 12,000 CLP that could only be spend for the conservation of the species shown in the photographs. You can allocate the money as you want to each of the species. The money will be used to develop activities for the protection of the species. The objective of the activities is to maintain or increase the population of the target animal. Again, I remind you, there is no right or wrong way to do it; it is only your opinion.

Specie	Amount of money (CLP)
Sp. A	
Sp. B	
Sp. C	
Sp. D	
Sp. E	
Sp. F	
Sp. G	
Sp. H	
Sp. I	
Sp. J	
Sp. K	
Sp. L	

7.2. Rating scale

How strongly do you support or oppose governmental protection of each animal? This last will mean the usage of tax money to develop activities for the protection of the species. The objective of the activities is to maintain or increase the population of the target animal.

The possible answers being: I - strongly oppose, oppose, oppose neither support, support and strongly support - it. Please select one option among the five given per species.

Species	*Strongly oppose it*	*Oppose it*	*Oppose neither support it*	*Support it*	*Strongly support it*
Sp. A					
Sp. B					
Sp. C					
Sp. D					
Sp. E					
Sp. F					
Sp. G					
Sp. H					
Sp. I					
Sp. J					
Sp. K					
Sp. L					

8. Knowledge of Threatened status

According to your knowledge, could you indicate using your finger which animals in the photographs are Threatened? This could mean that if something is not done for the animal, its population could be reduced and/or disappear in less than 100 years.

Specie	Yes	No
Sp. A		
Sp. B		
Sp. C		
Sp. D		
Sp. E		
Sp. F		
Sp. G		
Sp. H		
Sp. I		
Sp. J		
Sp. K		
Sp. L		

9. Knowledge of Endemism status

According to your knowledge, could you indicate using your finger which animals in the photographs, is Endemic? This mean the animal is only possible to find it in Chile, specifically in the river "Cruces" wetland, and nowhere else in the world.

Specie	Yes	No
Sp. A		
Sp. B		
Sp. C		
Sp. D		
Sp. E		
Sp. F		
Sp. G		
Sp. H		
Sp. I		
Sp. J		
Sp. K		
Sp. L		

10. General knowledge

Could you please tell me how much information do you have of each species?, e.g. where does it live, what does eat and the size of the population. The possible answer are:

Specie	Very few information	Few information	Neither few or enough information	Some information	Enough information
Sp. A					
Sp. B					
Sp. C					
Sp. D					
Sp. E					
Sp. F					
Sp. G					
Sp. H					
Sp. I					
Sp. J					
Sp. K					
Sp. L					

11. Section 2

Round 2: Two methods to elicit the support towards wildlife species providing colourful pictures, and scientific and common names of the wildlife species, and ecological traits as threatened and endemic status, and taxonomic group.

11.1. Money allocation

I will indicate which animals are and which are not Threatened (i.e., means if something is not done, e.g. conservation activities, the animals could be reduced and some of them disappear in less than 100 years.) / Endemic (i.e., Endemic means we can only find it, the animal, in Chile, e.g. within and the surrounds of the city of Valdivia, and nowhere else in the world.) / not amphibians fih and invertebrates with this label. With this new information, would you like to redistribute your support towards the animals or would you like to keep it like it is? I remind you, there is no right or wrong way to conduct the exercise, only your opinion is of interest.

	Amount of money (CLP)
Sp. A	
Sp. B	
Sp. C	
Sp. D	
Sp. E	
Sp. F	
Sp. G	
Sp. H	
Sp. I	
Sp. J	
Sp. K	
Sp. L	

11.2. Rating scale

I will indicate which animals are and which are not Threatened (i.e., means if something is not done, e.g. conservation activities, the animals could be reduced and some of them disappear in less than 100 years.) / Endemic (i.e., Endemic means we can only find it, the animal, in Chile, e.g. within and the surrounds of the city of Valdivia, and nowhere else in the world.) / not amphibians fih and invertebrates with this label. With this new information, how strongly do you support or oppose governmental protection of each animal? This last will mean the usage of tax money to develop activities for the protection of the species. The objective of the activities is to maintain or increase the population of the target animal.

The possible answers being: I - strongly oppose, oppose, oppose neither support, support and strongly support - it. Please select one option among the five given per species.

Species	*Strongly oppose it*	*Oppose it*	*Oppose neither support it*	*Support it*	*Strongly support it*
Sp. A					
Sp. B					
Sp. C					
Sp. D					
Sp. E					
Sp. F					
Sp. G					
Sp. H					
Sp. I					
Sp. J					
Sp. K					
Sp. L					

12. Gender

Could you tell me to which of the gender do you feel recognize? Female, male or other?

	Female
	Male
	Other

13. Age range

Could you please indicate me your age range?

	16 – 20		41 – 50
	21 – 30		51 – 60
	31 - 40		61 – 70
	71 - 80		81 – or more

14. Monthly income

In the case you have a monthly income, could you please indicate me in which range would be yours?

	None		601.000 – 700.000 CLP
	Lower than 300.000 CLP		701.000 – 800.000 CLP
	301.000 – 400.000 CLP		801.000 – 900.000 CLP
	401.000 – 500.000 CLP		more than 901.000 CLP
	501.000 – 600.000 CLP		Not anwered

15. Education

Which is your completed level of education or currently studying?

	None		University or Technical (complete)
	Primarily school (incomplete)		Postgraduate (incomplete)
	Primarily school (complete)		Postgraduate (complete)
	Higher school (incomplete)		Not anwered
	Higher school (complete)		
	University or Technical (incomplete)		

16. Years living in Valdivia

Could you please tell me how many years have you been living in Valdivia?

	I do not live in Valdivia		More than 20 years
	Not more than 10 years		More than 40 years
	Not more than 20 years		

17. Day a day in the last five years?

Could you please tell me where you spend your day a day in the last five years?

	In the city
	In the countryside
	In the city and countryside

Appendix 2 Differences between 2018 and 2018 for two methods to measure support towards wildlife species.

				Δ 2018 - 2019					
Species				Money allocation			Rating scale		
MCRT	1	4	7	726	49973.000	406.70 (368)	725	83549.500	411.78 (366)
	2	5	8	49973.000	2746.805	319.09 (358)	83549.500	2368.310	313.27 (359)
	3	6	9	114234.000	-5.788	< .000	150710.5000	7.538	< .000
SFG	1	4	7	726	80096.000	333.92 (368)	723	74962.000	388.31 (366)
	2	5	8	80096.000	2669.799	393.91 (358)	74962.000	2389.330	335.02 (357)
	3	6	9	144357.000	5.328	< .000	142123.000	4.031	< .000
CH	1	4	7	726	80096.000	324.85 (368)	726	72562.500	381.72 (367)
	2	5	8	80096.000	2669.799	403.23 (358)	72562.500	2436.719	344.88 (359)
	3	6	9	144357.000	5.328	< .000	140090.500	2.744	.006
CW	1	4	7	726	74694.000	336.94 (368)	724	73410.000	384.12 (365)
	2	5	8	74694.000	2414.806	390.81 (358)	73410.000	2515.515	340.52 (359)
	3	6	9	138955.000	3.653	< .000	140205.000	3.138	.002
CYO	1	4	7	726	72485.000	345.53 (368)	725	78239.500	397.19 (367)
	2	5	8	72485.000	2667.406	381.97 (358)	78239.500	2590.261	327.95 (358)
	3	6	9	136746.000	2.479	.013	145767.500	4.844	< .000
SASL	1	4	7	726	64797.000	366.42 (368)	722	72739.000	382.38 (363)
	2	5	8	64797.000	2601.518	360.50 (358)	72739.000	2665.517	340.38 (359)
	3	6	9	129058.000	-.413	.679	138805.000	2.844	.004
CT	1	4	7	726	67389.000	359.38 (368)	726	83497.500	411.51 (367)
	2	5	8	67389.000	2601.808	367.74 (358)	83497.5000	2616.625	314.42 (359)
	3	6	9	131650.000	.583	.560	151025.500	6.734	< .000
BF	1	4	7	726	68113.500	357.41 (368)	726	84004.000	412.89 (367)
	2	5	8	68113.500	2601.963	369.76 (358)	84004.000	2562.083	313.01 (359)
	3	6	9	132374.500	.861	.389	151532.000	7.075	75659.500
FWCF	1	4	7	726	74694.000	339.53 (368)	726	73518.500	411.51 (367)
	2	5	8	74694.000	2414.806	388.14 (358)	73518.500	2616.625	314.42 (359)
	3	6	9	138955.000	3.653	< .000	141046.500	6.734	< .000
FWPC	1	4	7	726	64458.000	367.34 (368)	726	77683.000	395.67 (367)
	2	5	8	64458.000	2329.476	359.55 (358)	77683.000	2685.736	330.61 (359)
	3	6	9	128719.000	-.607	.544	145211.000	4.396	< .000
FWF	1	4	7	726	68061.5000	357.55 (368)	726	75659.500	390.16 (367)
	2	5	8	68061.5000	2422.427	369.62 (358)	75659.500	2680.885	336.25 (359)
	3	6	9	132322.500	.904	.366	143187.500	3.649	75659.500
SP	1	4	7	726	66838.000	360.88 (368)	725	74614.000	387.36 (366)
	2	5	8	66838.000	2109.346	366.20 (358)	74614.000	2723.862	338.16 (359)
	3	6	9	131099.000	.458	.647	141775.000	3.274	.001

1 Total N

2 Mann-Whitney U

3 Wilcoxon w

4 Test Statistic

5 Standard Error

6 Standardized Test Statistic

7 Mean rank 2018 (N)

8 Mean rank 2019 (N)

9 Asymptotic Sig. (2-sided test)

a The significance level is .050.

b Asymptotic significance is displayed.

Green colored, a significant positive increment from 2018 to 2019.

Blue coloured, a significant negative increment form 2018 to 2019.