Feathered Roots and Migratory Routes: Latin American Immigrants and Birds

by

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AUTHOR'S DECLARATION

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.
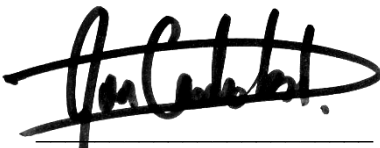
STATEMENT OF CONTRIBUTIONS

In the Department of Environment and Resource Studies, two forms of presentation of the doctoral dissertation are permitted: (1) a standard dissertation monograph, and (2) a manuscript option centred on three or four published or publishable learned journal-type manuscripts on related matters, packaged with introductory and concluding chapters that integrate the purposes/ research agenda and findings/implications, with the required result forming a conceptual whole. This thesis used the manuscript option. Specific requirements relating to the manuscript option, which have been met, are as follows:

- The manuscript-based dissertation must reflect a consistent overall conceptual foundation and research agenda and the parts must be integrated to form a coherent package. The whole must be related to the overall purposes of the Environment and Resource Studies (ERS) doctoral program, and the individual components of the dissertation must originate from the doctoral research.
- The manuscripts must be dominated by the intellectual effort of the student. While members of the advisory committee and others involved in the research may, as appropriate, be listed as secondary authors on individual manuscripts, the manuscripts must be written by the student, and the student must be the first author on each manuscript.
- Where multiple authorship occurs, there must be a preface statement in the thesis outlining the roles of the respective authors, and clarifying the extent and nature of the contribution of the student. Co-authors must sign the statement to indicate that they are in agreement with the evaluation of the roles and contributions of the various authors.
- In no case can a co-author serve as an external examiner for the thesis. Findings from this dissertation research are reported in three co-authored manuscripts (chapters Two, Three and Four).

These chapters have been prepared for submission to refereed journals; only Chapter 1 has been submitted for publication. I testify that I am the primary author of the manuscripts in my dissertation, and that the work was dominated by my intellectual efforts.

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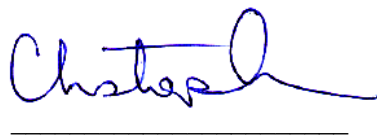
J. Cristobal Pizarro (Student)

Co-authorship for Brendon Larson (Adviser) in Chapters 1 and 2, and Christopher Anderson in Chapter 1 was determined based on meeting the following criteria:

- Substantial contributions to the conception and design of the work, and to interpretation of data;
- Contributions to editing and revising the work critically for important intellectual content;
- Final approval of the versions of the chapters that will be published as refereed journal articles;
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

I testify that J. Cristobal Pizarro is the primary author of the manuscripts in this dissertation, that the work was dominated by his intellectual efforts, and that I have met the four tests outlined above.

_____   Brendon Larson (Advisor), University of Waterloo

_____   Christopher Anderson, CADIC-CONICET, Argentina

Abstract

In our current age, which some call the Anthropocene, humans experience the combined effects of accelerated human mobility and ecological changes. These changes may affect people's well-being, including their emotional and psychological connections to place and biodiversity. Birds are outstanding among organisms for the degree to which they emotionally evoke associations with places, and for immigrants birds can represent proxies of connection to several places. In this work, immigrants' sense-of-place is considered to have attachments to birds in both roots-and-routes, where "roots" symbolize places of origin and "routes" represent new places where immigrants settle. By conceptualizing place and nature together, therefore, this work adds complex social dimensions, such as place attachment and identity, to the study of human-biodiversity relationships in the Anthropocene.

The overall purpose of this work is to understand the intersection between human mobility, place and biodiversity in the Anthropocene, and how birds can help people adapt to change. To examine the role birds play in sense-of-place, I interviewed 26 recent immigrants with their roots in eight countries in Latin America and their routes in Canada and the United States of America. Using ethnographic interviews and different analytical tools (e.g., mindmaps and culturegram-timelines), I collated information about bird species that were significant to the participants, along with their meanings, including social and ecological factors that participants associated with these relationships. To deepen my understanding of social factors, I investigated the dynamic trajectory of participants' relationships with birds through their life-stages, considering immigration as an integrated stage alongside childhood, adolescence and adulthood. Finally, to communicate my positionality in this work, I conducted an autoethnography to document memories where birds evoked events, places and identities, and how these memories comprise units of a researchable personal biocultural memory. Within personal people-biodiversity-place connections, biocultural memory is proposed to bridge the gap between self, culture and nature.

A bird constellation of some 150 species in Latin America and 70 species in Canada and the U.S.A. represented for participants a roadmap between roots-and-routes, together with another 19 "accompanying" or shared birds. Additionally, several "key" birds were critical in helping participants adapt to their new place. These key and accompanying species, indeed, signified points of reference in the process of "recalibration" of participants' sense-of-place. This recalibration process

was based upon a degree of bird familiarity ranging from the recognition of birds participants knew from their roots to the admiration of completely "new" species in their routes. Key species represented either taxonomic equivalents (birds similar in appearance) or ecological equivalents (birds with similar habitat or behaviour). Within this range of familiarity, people relocate the geographical place experience of where they are. By recognizing species, whether familiar or unfamiliar, people recalibrate their geographical experiences. When participants recognized species that were particularly meaningful to their cultural background or professional achievements, they gained self-realization and continuity of their identity. Importantly for the achievement of place- and identity-recalibration, the communication and sharing of stories and experiences was paramount. Specifically, this "socialization" with birds was reported as the most important factor fostering adaptation in the new place. Although it took varied forms, socialization was the main engine generating meaningful relationships with birds through all participants' life-stages. During childhood, for example, socialization was achieved via childhood play in nature, whereas in early adulthood it was achieved through social networks with peers and friends. These people-bird-place interactions create living memories that drive a dynamic biocultural memory and identity.

This study of immigrant-bird relationships provides several important insights for thinking about and engaging with novelty in the Anthropocene. These insights reveal the necessity to reconceptualize ecosystems together with societies as novel socio-ecosystems and to rethink humans' place within them. Analyzing this scenario, I direct responsibility to scientists communicating and applying research to confront ecological and social sustainability challenges. Confronting these challenges demands the creation of effective politics of conviviality between humans and nonhumans from different places. More specifically, considering the capacity of people to connect with birds, I provide recommendations to increase newcomers' participation in bird-related activities and to help foster integration of immigrants and nature in our increasingly multicultural societies.

Acknowledgements

Dedication

To my partners in flight, Marcia, Sofia and the little feathered ones.

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Chapter 1

Introduction

1.1   Research context and problem rationale

In the 21st century, accumulated evidence from many fields of knowledge shows the impact of human-driven global change on our relationship with nature and the planet (Millennium Ecosystem Assessment 2005; Szerszynski 2012; Ellis 2013). This chapter illustrates how this dissertation's research fits into the larger context of human-nature relationships and global change, both conceptually and empirically. More specifically, this introduction shows how the study of immigrant-bird relationships serves as a model to answer broader questions about the dynamics of three complex components of the scenario of change: human mobility, place and biodiversity. These topics have been individually developed by disciplines from distant fields (e.g., sociology and biology) and integrated by interdisciplinary fields such as human geography, ethnoecology and animal studies (Emel et al. 2000; Jerolmack 2009; Tidemann and Gosler 2010; Lorimer 2010; Head and Gibson 2012; Vannini 2015). However, there are still many conceptual gaps that need to be bridged, so that the results of this research can be more widely communicated and understood and more broadly applied.

It is an interdisciplinary research challenge, both theoretically and methodologically, to integrate concepts such as mobility, place and biodiversity. However, these concepts are widely accessible to the general public, which favors the communication of research outcomes. This duality provides an exciting opportunity to combine conceptually complex interdisciplinary research with applied sustainability fields, such as conservation biology and environmental education (Chapters 3 and 4). Moreover, I identify mobility-place-biodiversity dynamics that are co-occurring under a pressing scenario of accelerated social and ecological change known as the Anthropocene (Crutzen 2002). The Anthropocene comprises climate change, novel ecosystems and other expressions that are occurring at such magnitude and with such speed that scientists have formally proposed the Anthropocene as a new geological epoch (Lewis and Maslin 2015). Concurrent with ecological changes, an accelerated human mobility largely contributes to the emergence of super-diverse societies that have led social scientists to rethink their formulations (Blunt 2007; Vertovec 2007; Cresswell 2011b). In this context, the Anthropocene is used here as an heuristic concept to draw attention to the global-scale social and ecological changes that have already permeated our contemporary ecosystems, societies, public

opinions, and scientific and political imaginations (Fig. 1.1; Millennium Ecosystem Assessment 2005; Barbieri Masini 2011; Lorimer 2012).

Within the scenario of social and ecological change, immigrants and birds represent two sides of the idea of change by mobility. It is very clear that when people immigrate, they will probably confront a new language, social norms or culture. In many cases, this situation represents an abrupt social change. An issue less clearly exposed is that the immigrant may also experience a dramatic ecological change, as he or she encounters a new and contrasting set of climate, landscapes, animals and plants in the new place (Wolch and Emel 1998; Philo and Wilbert 2000; Jerolmack 2007; Fresque-Baxter and Armitage 2012). Therefore, a change of place for an immigrant constitutes a complex social-ecological change (e.g., Elder et al. 1998).

Among animals, I chose birds to represent biodiversity in this change for several reasons. Worldwide, birds have cross-cultural and historical significance, and by their capacity to fly they not only signify mobility but actually embody it (Mynott 2009; Tidemann and Gosler 2010). Birds can travel astonishingly long distances during seasonal migration, connecting places and countries within or even between continents and hemispheres. The Arctic Tern, for instance, annually travels 71,000 km from pole to pole during the spring and fall (Figure 1.1). Birds, therefore, are conspicuous representatives of a nature that is mobile; and therefore, they can function as proxies of immigrants' emotional, psychological and cognitive attachment to several places. Moreover, birds inhabit a wide-range of habitats, from the most populated cities to traditional rural landscapes and remote wild lands. For people on the move, their experiences with birds not only account for environmental aspects of the change of place but also act as proxies of social and cultural changes (e.g., the changes associated with moving from a rural to an urban place). For these reasons, I consider bird connections, relationships and meanings as study units of "sense-of-place," intersecting both human mobility and biodiversity. Sense-of-place, at the same time, is a human faculty that weaves together self, social bonds and place features in different degrees of attachment, identity and dependency (Scannell and Gifford 2010).

Understanding the interaction between biodiversity and mobility also creates an opportunity to study ecosystems and societies as an integrated whole ("socio-ecosystems") rather than as separate "ecosystems" and "societies." As expressions of biodiversity and mobility, immigration and global ecological change simultaneously alter the historical composition of ecosystems and societies. Human-nonhuman relationships in socio-ecosystems span a range of familiarity, in which

newcomers, at one extreme, can interact with local resident species and long-term residents, at the other extreme, can interact with newer introduced species (Chapter 3). One may argue that these situations have occurred since time immemorial (Mateos et al. 2013; Aronson et al. 2014). However, it is difficult to deny that the speed, frequency and variety of these encounters (and all the situations "in between") are among the most remarkable aspects of the Anthropocene. I theorize that the simultaneous drivers of both human and nonhuman mobility produce "novel socio-ecosystems" (Chapter 2), and the study of sense-of-place of immigrants with birds aims to integrate two aspects of novelty that have been studied to this point in separate disciplinary domains.

Northern Wheatear (*Oenanthe oenanthe*)
Artic Tern (*Sterna paradisaea*)
Amur Falcon (*Falco amurensis*)
Short-tailed Shearwater (*Puffinus tenuirostris*)
Ruff (*Philomachus pugnax*)
Swainson's hawk (*Buteo swainsoni*)
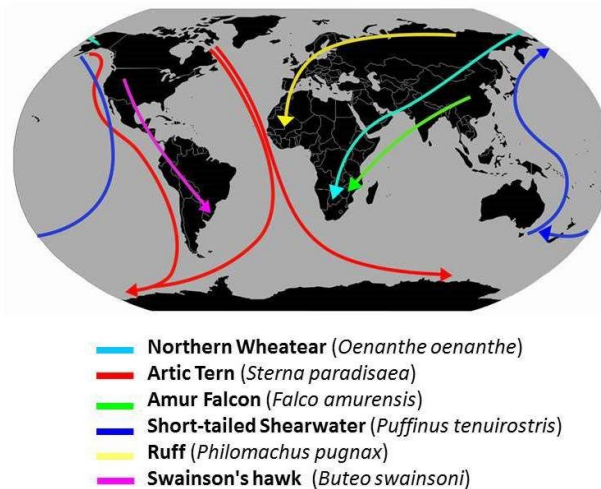
Figure 1.1. Examples bird species migratory flyways (modified from wikimedia public domain image). These routes show connections between continents that can be ideal for exploring bird-immigrant relationships

For example, ecologists have determined that drivers such as climate change, anthropogenic habitat modification, and the introduction of new species create "novel ecosystems" that have crossed a threshold and differ from their historical counterparts in composition and function (Hobbs et al. 2006; Hobbs et al. 2013). Meanwhile, social scientists describe the novel challenges of understanding how accelerated human mobility contributes to "super-diverse societies" (Vertovec 2007), transnationalism (Blunt 2007; Sheringham 2010) and multiculturalism (Mac Laughlin 1998; Gidoomal 2003). Human mobility, in particular, is seen to be caused by a set of diverse factors, not limited to transnational economic immigration, flexibilization of labour and markets, education abroad systems, and forceful ideological, economic and climatic displacement (e.g., SICREMI 2011). This variety of "reasons" to move produces a historically different type of cosmopolitanism (Blunt

2007; King et al. 2010). Problematizing the two social and ecological phenomena as one, people in the Anthropocene are confronting a scenario different from previous historical moments. In such a context, we have just started to discuss and study the political, social, and psychological impacts that the Anthropocene may produce on human-nature relationships (Lorimer 2006; Anderson and Harrison 2010; Lorimer 2012) and humans' sense-of-place (Gustafson 2001; Merriman et al. 2008; Manzo and Devine-Wright 2014).

Immigrants' sense-of-place, and the role biodiversity plays in it, emerges as a subtle yet decisive dimension of mobility as a social and ecological phenomenon. Compared to the development of sedentary and anthropocentric perspectives within place theory (Scannell and Gifford 2010), the intersection of place with biodiversity and human mobility has received fewer scholarly attention. Social scientist have been focused on animal (human) practices (Elder et al. 1998; Jerolmack 2007), and in most cases, biodiversity in place literature has been left unspecified and vague; the environment thereby becomes "face-less," with specific species left unidentified (but see Hannon 1994; García-Quijano et al. 2011; Laird et al. 2011). Conversely, in this research (Chapter 3), I conceive birds (and biodiversity in general) as active components or "agents" of place, both physically and symbolically present in the life of immigrants. Bird relationships are also considered within the continuity of tensions, attachments and dynamics between places of origin, immigration, and in between (Gustafson 2001; Manzo and Devine-Wright 2014). The continuity of these relationships is treasured in memories and experiences with birds across life stages, which forms a route from childhood through adulthood (Chapter 4 and 5). This research seeks to capture the dynamism of human meanings of biodiversity and place, and use human-bird relationships as units of study addressing the effects of the Anthropocene at the individual level.

Having immigrants and birds as main characters of this research, however, I appeal to a broad trans-disciplinary audience (Pretty 2011). At the same time, the guiding themes of this research (human mobility, sense-of-place, and the Anthropocene) have been more carefully and cross-sectionally studied by social scientists, including human geographers (Tuan 1977; Relph 1997; Cresswell 2008), sociologists (Gieryn 2000; Trentelman 2009) and environmental psychologists (Proshansky 1983; Kyle et al. 2005; Kyle et al. 2014). From them I borrow key concepts, methods and tools, such as "identity", "attachment," and "agency" that may be challenging for natural scientists. I also use ecological concepts, such as "novel ecosystems" and "ecological function," including binomial taxonomic bird classification. In this way I pair social and ecological concepts,

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such as agency (extensively used in social sciences) with the biological notions of animal behaviour and habitat preference. From this combination, raptors (e.g., hawks and eagles) exercise their own agency, for example by being generalist birds of prey that commonly inhabit urban areas. This approach better situates the analysis of immigrant-bird encounters in both their social and ecological dimensions, bringing biodiversity and human studies onto a common ground.

To accomplish the comprehensive reading of this dissertation, this section includes the main research questions and objectives and a literature review integrating the main concepts and philosophical assumptions used in the manuscript chapters. The review interweaves the key concepts (human mobility, place and biodiversity) into two main dissertation themes: i) human-nature relationships in the Anthropocene and ii) sense-of-place in the age of mobility. This review aims to clarify the use of concepts, definitions and approaches, including the location of this research in the literature and existing theory. At the end of the review, I provide a section with the empirical context revisiting the research problem and another section with the research's philosophical assumptions with clarifications of my position as a researcher (see also Chapter 5). Finally, I comment on the overall methodological approach and several ethical considerations and limitations, before proceeding to the description of the organization of the dissertation and each of its chapters.

1.2 Research questions and objectives

In general terms this research aims to better understand the relevance of animals, specifically birds, to immigrants' emotional and psychological adjustments to new surroundings. It documents how meaningful birds can be in the new life of immigrants, how their prior relations with birds can shift as they immigrate, potentially stimulating the development of novel relationships with birds in the new place. Following Gustavson's (2001) framework, as described further below, I conceptualize places of origin as "roots" and new places as "routes" to illustrate the dynamism and uncertainty of the current scenario of human mobility (King 2010). In this sense, birds are proxies of emotional and psychological connections to "roots-and-routes", as well as personal connections between place and biodiversity. I conceptualize my research working across three nested levels of change (Figure 1.2), including i) the Anthropocene (at the planetary scale), ii) simultaneous changes in ecosystems and societies, and iii) the impact of these changes at the individual level, represented by immigrants and birds.

Situating the research problem in the geographical context of the Americas, I investigate the role a range of bird species play in the sense-of-place of Latin American immigrants to Canada and the

United States of America. The birds include cosmopolitan, Neotropical, Palearctic and Subantarctic species. I consider biological features, such as their habitat preference and behaviour, as well as their symbolic and physical interactions with humans. I detail how these bird meanings and interactions nourish the relationships of Latin Americans in their new place, with six specific objectives (with associated methodological approaches detailed further below).

- To illustrate how the study of bird-immigrant relationships conceptually situates the intersection between biodiversity and human mobility within novel socio-ecosystems.
- To document immigrants' narratives about birds in their relocation experiences, connecting birds' meanings to broader experiences of sense-of-place in the context of the Anthropocene.
- To identify which specific birds immigrants recall from their roots in Latin America and recognize in their routes in Canada and the U.S.A.
- To develop qualitative models explaining the mechanisms by which humans associate birds with their places of roots-and-routes.
- To explore the extent to which changes in a person's lifestyle (e.g., city-rural dwelling, adoption of outdoor activities), livelihood (social interactions, occupation), and cultural practices and traditions (e.g., bird-keeping, bird-watching, bird-feeding) influence their relationship with birds across places and life-stages.
- To provide recommendations for environmental educators and relevant social actors promoting immigrant integration and social cohesion in multicultural societies.

1.3   Literature review

This section reviews the main themes of this work. Each thematic area is explored in terms of three key concepts: the Anthropocene, ecological change and human mobility. The first theme, human-nature relationships in the Anthropocene, discusses the three prevailing images of nature in Western culture and their pertinence in the current scenario of change. Despite the diversity of cultural images of nature (Moller and Kitson 2009; Stephenson and Moller 2009; Rozzi 2010), and that many of these images coexist within Western societies, the three images presented in this section—nature as independent state, dependent colony and co-production—clearly illustrate the contested imaginary of nature in the Americas, their countries, educational systems, and institutions (Callicott 2008; Gudynas 2011). To conclude this section, I propose to conceive human sense-of-place as a co-production with

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nature. The concept of "novel socio-ecosystems" operationalizes this co-production of nature and provides the theoretical-empirical linkage to situate this research in the literature.
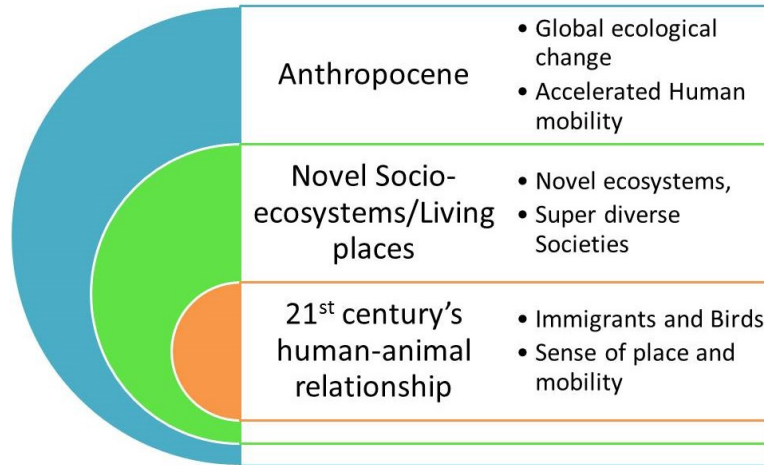
Figure 1.2 Levels of human-nature relationship in the context of social-ecological change in the Anthropocene. This figure also represents the three space-time levels of research of this dissertation.

The second theme addresses the topics of place and mobility. Recognizing place literature as a large body of knowledge, this subsection focuses on a psycho-sociological framework of place attachment, place identity and place dependency (Scannell and Gifford 2010). Later, I criticize the way this model has been used to study immigrants' place attachment and identity in comparison to long-term resident (e.g., Hernández et al. 2007). In the view of this research, such a strategy anticipates an antagonism between mobility and place, which is incongruent with current scenarios of human mobility where people may feel anchored to multiple locations (Manzo and Devine-Wright 2014). To overcome this problem, I adopt the incipient place framework of roots-and-routes (Gustafson 2001) that considers human mobility as part of sense-of-place.

These two proposed concepts, nature as coproduction and roots-and-routes, are the main pillars of this dissertation. While the complex idea of nature as co-production, working more in the background than in the foreground, captures the philosophical assumptions underlying the dissertation, the framework of roots-and-routes gives structure to its methodology, analytical tools, and empirical research (Chapters 3, 4 and 5).

1.3.1 Human-nature relationships in the Anthropocene

Nature—the nonhuman world—is a domain always disputed by different cultural imaginaries and contested powers (Johnson et al. 2009; Jay et al. 2012; Barnaud and Paassen 2013). From nature, we not only obtain resources but meanings and explanations of our own existence. At the same time, human cultures contain a set of attributes that include languages, discourses and values that guide the way we observe, understand and use nature. Using these imaginaries, people differentiate themselves from others, and create metaphors depicting their ideals of nature that define and redefine the place for humans in it (Larson 2011a). Accordingly, our relationships with nature are imprinted in sociocultural abstractions or "images" of nature (Hinchliffe 2007; Buijs 2009; Buijs et al. 2009).

For example, alternately viewing nature as Mother Earth, resources or wilderness illustrates the wide range of ways in which humans politically represent nature and conceptualize themselves in it (Hinchliffe 2007; Callicott 2008). In these depictions nature is represented, loved or used in different cultural ways. At the same time, these images reflect not only cultural differences but also social and political stands between people with asymmetrical economic and political powers (Johnson et al. 2009; Peters 2010). These two aspects of nature, the cultural and socio-political, are indeed paramount in the 21st century, where international institutions have recognized that societies are increasingly multicultural and unequal (UNICEF 2011; UN 2015). Therefore, the sustainability challenges of these times, and the ones forthcoming, emerge from the necessity to create more mechanisms to help overcome inequality and to recognize and respect cultural differences (Ryan and Deci 2001; Millennium Ecosystem Assessment 2005; Morgan 2011). In this way, we can harmonize two diversities within the world, the cultural and the natural, as one, known as biocultural diversity (sensu Maffi 2005; Bridgewater et al. 2007; Terralingua et al. 2011).

To help conceptualize the diversity of human-nature relations, geographer Steve Hinchliffe (2007) didactically organizes three prevailing Western ideals of nature: 1) nature as a threatened state independent of human society, 2) nature as a dependent colony for holidays, and 3) nature as a co-production (Figure 1.3). In these three images, nature has different shapes (state, colony and co-production), and humans have different assigned roles in nature: 1) to threaten and protect, 2) to visit or recreate with, and 3) to produce nature. The first two images confine nature to places far away from humans, while assigning humans different roles and tasks. The third one is the most complex, where nature is "here and now" and its shape is completely context-dependent in its interactions with humans. This interdependency implies that humans are active components of nature, and therefore the form of nature will vary depending upon the way that humans relate to other humans and nonhumans.

Accordingly, nature can exist with and without us, or where the impact of our activities can or cannot reach. Given that human activities have expanded to a global scale, this most flexible image of nature better suits the scale of ongoing social and biophysical changes.

The images of threatened state and dependent colony give different degrees of autonomy and sovereignty to nature. In the image of state, humans ought to protect nature from themselves by creating and maintaining reserves where the nonhuman world can flourish and thrive. The image of the colony is nested within this view, where humans hold remote control over nature, and can pay a visit to nature during holidays (Figure 1.3). These two images accord with the concept of "wilderness," which in Old English means a "land inhabited by wild animals." This image is prevalent in the imaginary of European environmental philosophy and science, even though it is a very distinctive view that contrasts greatly with other cultural views of nature (Johnson et al. 2004; Callicott 2008; Buijs et al. 2009; Lupp et al. 2011).

Figure 1.3 Three examples of Hinchliffe's images of nature. Upper: Nature as an independent state (Cape Horn National Park, Chile. Photo Rodrigo Molina). Lower Left: Nature as a

dependent colony (summer cottage, southern Ontario). Lower Right: Nature as a coproduction (community garden, Vancouver)

The image of an externally preserved nature or wilderness was carried by European immigrants to their colonized territories (Aslin and Bennett 2000; Callicott 2008; Smith 2011). Later, during the creation of independent nations/states from Europe, this idea widely prevailed within public opinions and broader institutions (Toupal 2003; Vining et al. 2008). The institutionalization of national parks and wildlife management, for instance, provides a good example of the materialization of this view. In the same worldview, wilderness can be embedded within a much broader concept known as the "environment," which etymologically means "the aggregate of the conditions in which a person or thing lives." Then, the natural environment comprises a part of nature that is there to be used (e.g., for water, food, energy), and it is represented in higher institutional levels as "natural resources" (e.g., Ministry of the Environment or Natural Resources). These institutions administer nature as a public good to be used under specified human activities with different degrees of control and value (Gudynas 2009a; Gudynas and Acosta 2011; Keulartz 2012). Despite having been amply criticized, deconstructed and demystified by Western and non-Western intellectuals (Naess 1991; Latour 1993; Carolan 2005; Leopold 2007), this human/nature dichotomy continues to form much of the ruling principle of modern nations/states today.

In the following subsections, I first elaborate on the idea of nature as a coproduction, and then turn to one way to operationalize that idea, novel socio-ecosystems. Finally, I describe a "convivial" way for humans to co-produce nature. This last line of thought guides the ethical principles of the dissertation, which are expanded further below in the section on assumptions/positionality.

1.3.1.1 Nature as coproduction

The image of nature as a co-production can be approached from multiple theoretical angles. Here, I provide a brief overview of the theoretical underpinnings of co-production, with further details in Appendix 1. Nature can be interpreted as a relational space where humans and non-humans interact through diverse forces or powers that originate from two inseparable "social" and biophysical domains (Hinchliffe 2007; Hinchliffe and Whatmore 2009). For this reason, nature has no particular representational form or state, yet can be found and illustrated everywhere by focusing attention onto the materiality of human-nonhuman assemblages and their powers. From an old-growth forest to a metropolitan landfill, these assemblages of things and powers acquire material form by persisting and engaging in interconnected biosocial processes (Anderson and Harrison 2010; Bennett 2010).

Nature as coproduction contains the human and nonhuman diversity of the world. The cultural expressions of humans, whether material or symbolic (e.g., art, institutions, medicine, rituals, and technology), are integrated within the biophysical domain and its biotic and abiotic components, biogeographical patterns and biogeochemical processes. We can now consider human societies reciprocally co-producing nature with rivers, climates and ecosystems across the boundary of social and biophysical domains (White and Wilbert 2009). This combination of specific human-nature realities, at the same time, affects the evolution of animals and plant species, the emergence of cultivars, and the shape of ecosystems and landscapes in different regions of the world. These co-existing cultural and natural realities comprise the multinaturality of the world (Latour 1996; Lorimer 2012). In sum, nature is contextually co-produced by the sum of all its human and nonhuman components, forces and processes (Appendix 1). Accordingly, for many, multicultural and multinatural diversities represent "two sides of the same coin," thereby overcoming the human/nonhuman dichotomy (Maffi 2005; Toledo and Barrera-Bassols 2008). We can therefore examine nature without imposing previous assumption of value: nature is what it is, with or without us.

To equally consider the components of human and non-human diversity, it is necessary to rethink the unit(s) by which we study them. In the next section, I introduce the concept of novel socio-ecosystems to integrate expressions of ecological novelty in the Anthropocene with the social novelty created by accelerated human mobility.

1.3.1.2 Operationalizing nature as coproduction: Novel socio-ecosystems

The 21st century emerges as the tipping point to conceive nature as co-production. Worldwide, scientists have compiled enough evidence to argue that human activities are now transforming the planet at a global scale (Ellis 2013). As noted earlier, the speed of these changes have led scientists to formally propose the Anthropocene as a new geological epoch (Crutzen 2002; Lewis and Maslin 2015). Beyond the geological discussion, the Anthropocene concept presents a clear opportunity to think of nature (and humans within it) differently than our predecessors did so (Aslin and Bennett 2000).

In the Anthropocene, humans are co-producing nature even beyond their physical reach. Among other impacts, anthropogenic CO_2 emissions have transformed the biochemistry of the ocean and the composition of the atmosphere, altering the entire atmosphere-biosphere system (IPCC 2014). Indeed, over the past 300 hundred years we have released enough CO_2 to the system to increase ocean acidity

to a level not exceeded in the last 300 million years (IGBP et al. 2013). If climate and ocean change is global, and it is affecting places we considered to be "pristine" nature, then the idea of sustaining nature as an independent state is outdated. Although the very idea of the Anthropocene (humans changing the planet) was envisioned by philosophers in the early 20th century (e.g., Vernadsky 1945), it is only during the past few decades that we have achieved a thoughtful understanding of its underlying mechanisms and outcomes (Essl et al. 2012; IGBP et al. 2013; IPCC 2014).

For example, the direct and indirect impact of human activities has driven major changes in the composition of biomes and ecosystems. These ecological changes co-produced anthropogenic biomes and novel ecosystems, which differ from their historical antecedents (Chapter 2, Ellis et al. 2010; Hobbs et al. 2013). Novel ecosystems are driven by the complex interconnections between biophysical phenomena (e.g., climate, super-storms, wildfires) and pulses of anthropogenic disturbance (e.g., urbanization, mining, and forestry). Both biophysical and anthropogenic drivers of change are influenced by patterns of economic development (Milton 2003), such as the pattern of "boom and bust" in agricultural, forestry and mining systems and markets (Rodrigues et al. 2009; McAlpine et al. 2009; Clement 2010; Gould 2011). Furthermore, this same set of anthropogenic drivers not only affects the biophysical environment, but also societies; for example, consider the relationship between global markets and transnational mobility (e.g., migrant rural workers, Andrzejewska and Rye 2012) and between climate change and forceful displacement (Piguet et al. 2011).

In the biophysical landscape, cycles of land exploitation, transformation and abandonment of landscapes creates opportunities for new introduced species as well as for local historical species to self-organize to create novel ecosystems (Hobbs et al. 2009). In addition, climate change is altering seasonality and cycles of species, which contributes to shifts in ecosystem composition. For example, in western North America, changing rainfall patterns not only cause severe droughts and wildfires, but also affect the assemblage of biodiversity; it is predicted that entire bird assemblages will be dramatically different in less than 60 years (Stralberg et al. 2009).

The starting dates of the proposed Anthropocene epoch (formally Global Boundary Stratotype Sections and Points, GSSPs) are still under discussion. The Anthropocene's geological markers include the increase in methane after the intensification of farming practices (~1640) and changes in radioactive markers in the atmosphere since the detonation of the first atomic bomb in 1945. The latter date is coincidental with the increase of global temperature anomalies and the sharp increase in

atmospheric CO2 (Lewis and Maslin 2015). This Anthropocene benchmark also coincides with the beginning of acute social changes since World War II. In the last 30 years, people have become more mobile than ever in history, with an increase in transnational immigration by different means and for diverse reasons (Blunt 2007; King et al. 2010). Between 1990 and 2013, the number of international migrants worldwide increased by 50%, reaching 232 million people on the move (UN 2013). In parallel, in 2007, for first time in human history, more than half of the world's population lived in cities or urban areas, having grown from less than 30% in 1950 to 54% in 2014. Northern America and Latin America are the most urbanized regions, with over 80% of inhabitants living in cities (UN, 2015). Globally, immigration contributes to increase the urban population, as global labor markets drive people to seek education, job security and a better life in large urban centers (Vertovec 2007).

Since World War II, a never-ending and violent ideological-economic conflict has forcefully displaced thousands of people from their home countries (Collyer 2005; King et al. 2010). At the time of writing this work, this conflict has created one the worst refugee crises in history, affecting the Middle East and Northern Africa as well as receiving countries in Europe (Connolly 2015). Since the 1970's and 80's, large cities in industrialized countries such as Canada, the United States, and Australia have become increasingly multicultural (Jupp 1997). For example, about 40% of the people in Toronto, Singapore and Auckland are foreign-born. As a consequence, human mobility is changing societies not only in terms of cultural composition, but also in patterns of urbanization and citizenship status and rights. Social scientists conceptualize this multilevel social change as the "mobility turn" (Blunt 2007; Cresswell 2011b).

In the context of this intense social-ecological change, nature as co-production can be considered "in between" societies and ecosystems. Nature, therefore, is not only co-produced but also highly mobile and dynamic. In this dissertation, I propose the term "novel socio-ecosystems" (Chapter 2), as a way to more effectively integrate the study of human and ecosystem novelty produced by global change. Although ecologists and geographers have achieved important advances in this direction (Liu et al. 2007; Collins et al. 2011; Carpenter et al. 2012), their human-nature discussions have not considered the breadth of social dimensions of mobility that characterize the Anthropocene and the mobility turn. I propose to re-conceptualize humans as participants in "novel socio-ecosystems," encouraging scientists to adopt a more integrated view of nature as coproduction.

In these novel socio-ecosystems, each person, plant or animal is an agent or "actant" capable of exercising its own power, its own capacity of being, to make itself noticed in the world (Latour 1993;

Bennett 2010). This capacity to be in the world can be understood as agency, and by its human-nonhuman agency, nature can have both material and conceptual meaning for humans. Under this conceptualization, particular human-nonhuman relationships can serve as proxies of multinaturality in the Anthropocene. In this regard, the encounters and relationship between people and birds in this dissertation, for example, can describe trajectories of larger range of places.

1.3.1.3   Conviviality: the role of human in nature as co-production
In contrast with earlier images, the role of humans in nature as a coproduction is upgraded from "colonist" to "participant" of nature together with the nonhuman world (Chapter 2, Hinchliffe and Whatmore 2009). This new role implies that the Anthropocene by no means marks "the end of nature," as some philosophers criticize (Williams 2007; Keulartz 2012; Szerszynski 2012); instead, the Anthropocene means that we achieve a forceful understanding of our connectedness and interdependency with nature. Such an understanding does not grant humans political *laissez-faire* towards the nonhuman world; instead, it emphasizes our shared responsibility to care for others and for ourselves (see UN global goals in http://www.globalgoals.org).

   Taking distance from more purely contemplative approaches to nature as a co-production, Hinchliffe and Whatmore (2009) offer a framework for action. They call for the generation of a politics of *conviviality* to address the heterogeneity of living together (i.e., reflecting the diversity of human-nonhuman engagements), not only considering the current scenario of inequality but also our relationship with biodiversity. This politics calls for the co-production of more welcoming spaces that take into account the every-day cultural practices of human and nonhuman inhabitants. This task requires the acceptance of a multiplicity of associations to open the range of possibilities to engage with people and nature, whether applied to street vendors and urban pigeons or wildlife supporters and urban woodlands. This politics proposes a greater democratization of the expertise of who decides how spaces are created and nature is co-produced (see "cosmopolitics" in Appendix 1). Applied to different types of actors, including humans-nonhumans and long-term residents-immigrants, this politics of conviviality requires a corporeal generosity where we accept and legitimate difference as part of our multinatural reality.

   Specific relations with animals and plants can empirically reflect the state of our current politics of conviviality. Several authors have advocated the use of animal studies to explore our ethical relationships with the world (Wolch and Emel 1998; Emel et al. 2000; Philo and Wilbert 2000; Castricano 2008; Head and Atchison 2008; Shapiro and DeMello 2010). Indeed, by examining

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differences we have already detected intercultural changes and intergenerational value shifts in orientations toward wildlife (Dayer, Stinchfield, & Manfredo, 2007; Teel, Manfredo, & Stinchfield, 2007). For this reason, I advocate for the wide communication of these ideas to applied fields of science with impact in policies for social and ecological sustainability.

1.3.2   Sense-of-place in the age of mobility

Our relationship with nature as co-production is also personal, formative and circumstantial. Beyond culture and ethnicity, our relationships with nature depend also upon our lived experience and the connections we have made with our immediate surroundings, including people, landscapes, animals and plants. According to this view, our connections with nature involve ties and bonds we generate with family members, friends and peers in diverse activities involving the nonhuman world (e.g., fishing, gardening, hiking, and camping). These practices create meaningful and memorable encounters with people and biodiversity that we treasure. Conversely, these social ties and memories become strong connections that shape our sense-of-place (Trentelman 2009; Sampson and Goodrich 2009; Peters et al. 2010).

Sense-of-place, or simply place, is considered within a broad body of literature shared among several disciplines of the social sciences and humanities (Relph 1997). From a socio-psychological perspective, our relationship with place is built upon multiple cognitive, emotional, social and functional connections with features of our biophysical and social environment (Scannell and Gifford 2010). Sense-of-place has three primary components: place identity, place attachment and place dependency, reflecting, respectively, cognitive connections, emotional bonds and personal achievements with places (Gieryn 2000; Hidalgo and Hernández 2001; Kyle, Graefe, and Manning 2005; Scannell and Gifford 2010)

Most place frameworks, however, take a sedentary perspective, focusing on identity, attachment or dependency with respect to a single location. Despite the current scenario of human mobility, this construction of place anticipates the results of studies on how as opposed to long-term residents relate to places. In these studies, as would be expected, long-term residents score higher on measures of place identity and attachment. In some instances, however, newcomers can have a similar (or even stronger) level of attachment, indicating that people can be strongly attached to multiple locations (e.g., Hidalgo and Hernández 2001; Hernández et al. 2007; Ray 2009; Qian et al. 2011). This evidence clearly suggests that there is a misplaced antagonism between sense-of-place and mobility,

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and its resolution is important for social cohesion and social-ecological sustainability in the context of the Anthropocence (Blunt 2007).

The antagonism between mobility and place attachment is counterproductive in the current scenario of mobility (Devine 2014). Sociologist Per Gustafson (2001), for example, criticizes this antagonism as defensive, and proposes a more organic perspective of roots-and-routes. This approach integrates place attachment and mobility to address the continuity within people's experiences among places. In my own reading of roots-and-routes, I argue that, in the scenario of accelerated human mobility, a large part of the population is feeling attached to more than one place. With some of these places, people will have stronger or bolder connections, hence representing their roots. Examples of people's roots might include their places of origin and childhood places with strong formative ties (see childhood section in Chapter 4). On the other hand, newer or "in progress" place connections can be conceptualized as routes, emphasizing the hyper-mobility and multiple destinations of people in this age (Vertovec 2007). Unlike previous historical moments when immigrants' new places were likely their final destination (e.g., in the Great Migration from Europe to North America, King 2010), people today have different reasons for moving (e.g., economic, political, personal or even climatic) and more accessible means to move (e.g., air travel and even ground transportation).

By investigating place connections of highly mobile people, we can provide a better understanding of how certain features of places can help people to adapt to change and create positive linkages with their new place. In my dissertation, I propose that biodiversity can play this role by symbolizing personal linkages with places and by evoking memories related to personal history and family (Hannon 1994; Lorimer 2006; Laird et al. 2011). In the place literature, features of the natural environment are broadly connected with the development of sense-of-place (Hay 2009; Scannell and Gifford 2010; Stedman 2003), or studied in very specific social contexts, such as cottage owners in Wisconsin and Manitoba (Jorgensen and Stedman 2001; Pitkänen et al. 2011). As a result, the combined effects of ecosystem change and human mobility have neither been fully integrated into the theoretical formulations of place nor considered as key dimensions and have not been formally connected with the Anthropocene (Lorimer 2010). Integrating biodiversity and social change, animals can be either windows to observe the world or even mirrors of ourselves (Mullin 1999), representing our roots-and-routes to different places.

1.4 Empirical context: revisiting research problem

In the context of this literature review, I now briefly return to my research problem to elaborate more specifically upon how my dissertation will address the question of how immigrants and birds interact in the Anthropocene.

During the early 19th century, human relationships with plants and animals were key foundations in the development of sense-of-place for European immigrants. At the beginning, those immigrants imported several species of animals and plants from Europe, as a way to keep ties with their places of origin or replicate the aesthetics of their home landscapes (Mirsky 2008; Webber and Scott 2012). However, during the creation of new nations/states, local animals and plants became stronger symbols of national identity. This adoption of local biota stimulated the creation of biological conservation initiatives to protect "native" biodiversity (Head 2012). In this social transformation, certain animals and plants came to function as iconic species that promoted environmental awareness for people having multiple origins (Aslin and Bennett 2000; Franklin 2007; Hinchliffe 2007; Ibarra et al. 2012). Under such conceptualization, new societies created institutions and organizations dedicated to protecting and managing the national natural environment from exogenous harm, including "foreign" invasive species that humans brought from elsewhere (Aslin and Bennett 2000; Larson 2010).

In the Anthropocene, the situation is different due to the combination of social and ecological changes that are creating novel socio-ecosystems (Chapter 2). These socio-ecosystems have a human and physical geography that is multinatural, meaning that people and species have different origins, represent different human-nonhuman realities, and have multiples roots-and-routes between them (Latour 1996; Blunt 2007; Lorimer 2012). Therefore, people's ability to distinguish between native and exotic flora and fauna may be reduced, and the concept of "native" biodiversity might not be as appealing as it was for people in the 20th century.

In this new context, the role that animals play in 21st century immigrants' identity- and place-making remains largely unexplored, generating questions about how human-animal relationships can mirror the novelty of increasingly globalized ecosystems and societies. To research human-animal relationship at this personal level nonetheless implies a careful consideration of particular circumstances alongside a broader social, cultural, political and biophysical context. Accordingly, to better understand how transnational immigration affects immigrants' current relationship with place and nature, it is necessary to understand the continuity and discontinuity of person-nature-place

bonds, in which animals are concrete components of the physical environment of places and culture of people (Davies 2008; Vannini 2015).

Among the members of the animal kingdom, I chose birds as proxies of people-place experiences. I consider that birds can represent roots-and-routes for many people, as they inhabit a wide variety of places, ranging from the wildest areas to the most populated cities in nearly all of the earth's biomes. Birds can represent cultural roots because they, in fact, populate our material and symbolic culture, being for example heraldic sacred animals or national symbols, such as the Andean Condor in Latin America and the Bald Eagle in the United States (Tidemann and Gosler 2010; Ibarra et al. 2012). In multiple ways, birds also form part of our everyday life, including for example the extremely utilitarian relationship that North Americans have with high-tech domesticated chickens. In between these extremes, birds can be poorly known, endangered or even extinct (e.g., the Eskimo Curlew), undesired guests or invasive species (e.g., European starling and Monk Parakeet), or ignored cosmopolitan urban dwellers that occur in everyday life in cities around the world (e.g., House Sparrow; see Sax et al. 2007; Jerolmack 2008; Mirsky 2008).

On the other hand, birds can represent routes. Because of their ability to fly, some birds can seasonally migrate long distances, thereby uniting continents and connecting biomes and ecosystems (Pizarro et al. 2011). Moreover, practices such as pigeon-keeping can, on the one hand, represent the ethnicity of the keepers, and on the other, inspire transcultural interactions among neighbours. With respect to the latter, pigeons have become ties to home for Italian and Turkish immigrants in New York and Berlin, at the same time that they are a means of socialization with new immigrants in their neighbourhoods (Jerolmack 2007; Jerolmack 2009).

In the context of this research, I conceptualize birds embodying roots-and-routes for people adapting and thriving in the Anthropocene. By studying the relationship between immigrants and birds, I aim to contribute to a better understanding of the connection between people, including their identities and attachments, to a nature that is highly mobile and co-produced. Observing what birds they know, or do not know, I see birds acting as connections along people's roots-and-routes, evoking memories about the past and about personal and professional achievements in their new places (e.g., becoming an expert birdwatcher in the new location and finding employment as a professional ornithologist). In this way, I transcend the mere biological understanding of birds to include their social functions (Chapter 3, 4, 5).

1.5 Philosophical assumptions and positionality

The main thematic areas discussed above not only provide the context of this dissertation but also suggest its philosophical assumptions. Here, I review these briefly and more explicitly. In particular, I have identified three assumptions as guiding principles of this research: nature as coproduction, multinaturality, and conviviality. The first and bolder assumption is that nature is dynamically co-produced by an assemblage of things (Bennett 2010). As is the case for any participant, humans attach their identity to or become the assemblages in which they participate (see Appendix 1, Chapter 3; Deleuze 2000). In empirical terms, accepting this assumption in this dissertation implies that:

- Places can be conceived and studied as assemblages of co-produced nature;
- People can attach their identity and meanings (i.e., becoming) to multiple places and their features;
- Whether in their roots or routes, features of place (i.e., birds) can be proxies of place experience by their own agency and human meanings.

These biodiversity-people-place connections are relevant for people's emotional and psychological well-being (e.g., (Mayer and Frantz 2004; Gosling and Williams 2010) In this scheme, immigrant-bird relationships reveal the trajectory of networks of assemblages that can be interpreted with the metaphor of roots-and-routes (Gustafson 2001). This metaphor is more attuned with the accelerated human mobility and ecological change in the Anthropocene.

The second guiding principle is the principle of multinaturality in the Anthropocene (Lorimer 2012). Social and ecological drivers and factors affecting human-nature relationships denote the interconnectedness between human and nonhumans. Locally, their associations create biological and cultural expressions that compose the overall biocultural diversity of the world (Maffi 2005; Terralingua et al. 2011). The existence of multiple geographies of nature, with their own biocultural diversity and evolutionary patterns, implies that the world is comprised of multiple networks connected by mobile components.

The accelerated mobility of both human and nonhuman components creates novel socio-ecosystems. These novel assemblages are comprised of representative of different realities of the world. In other words, mobility provides the opportunity for association among people from different cultures with plants and animals that have evolved in distant ecoregions (Marris 2009). As noted elsewhere, this process has always occurred in the history of the planet, but never at this rate, intensity and extent (Ellis 2011, King 2010). Empirically, the interconnection between mobile

components, such as immigrants and birds, is an illustration of the multiple outcomes of multinaturality in the Anthropocene.

A third and final assumption concerns conviviality, an ethical principle that expresses a commitment to social cohesion and environmental sustainability. The concept of conviviality (see above, Appendix 1, and Chapter 3) calls for human responsibility in co-producing nature as a relational and welcoming space for humans and nonhumans. Considering current inequity and multicultural societies, we need to take actions integrating people to our already novel socio-ecosystems. Even though there is uncertainty about the future (see critique to scientific objectivity in Latour 1996), the stakes are high given the potential severity of global change, so I think that current evidence suggests we should act, at least, by applying research to the best of our knowledge.

Personally, I come from a background in applied fields of veterinary science, conservation biology, and education, which influences my commitment to outcomes in these areas. I firmly believe that the findings of this research might be useful, applicable and widely communicated in these fields. One disadvantage of assuming such responsibility may be the commitment of time and effort (and text!) to develop recommendations for practitioners, and the need to adapt research to different audiences (e.g., conservation journals) or specific formats. However, I note that besides an ethical commitment, there is a long-lasting academic benefit in increasing readership and the opportunity to engage practitioners and decision-makers with dedicated research outcomes. Moreover, with this positionality I assume an identity and commitment to the birds and people of the Americas as a Latin-American ornithologist. For these reasons, I recurrently employ the first-person singular in the writing style through this work.

1.6 Overall methodology

Overall, the research design of this dissertation was conceived to explore, in great detail, the multi-level experience of people with birds in the process of immigration. In this process, birds are conceptually both (1) proxies of biodiversity in a changing scenario and (2) indicators of adaptation to places in response to human mobility. In this process of adaptation, people find birds amid numerous new social and ecological factors and drivers (e.g., climate, seasonality, language). As expected, this research not only deals with multi-scalar variables but also with the novelty of encounters of people and birds in the Anthropocene. For this reasons, this research required the combination of an integrative approach (phenomenology) with an intensive method of data collection (ethnographic interviews).

Phenomenology is a qualitative approach that allows for the integration of the dynamism of social and ecological phenomena within people's lived experience (Creswell 2007). Although the causes of mobility can be coercive (e.g., political displacement), the phenomenon of moving to one place to another is "conscious," "real" and shared (rather that imagined) by multiple people in the Anthropocene. People observe birds, and therefore birds can be proxies of experiences at multiple levels. Phenomenology also facilitates the use of sense-of-place theory to consider aspects of social and cultural adaptation by collecting participants' first-hand testimonies of social-ecological change. Then, to complement these experiences with biodiversity, I integrate these data with secondary ornithological data concerning particular bird species, their habitat use, and their behaviour (e.g., Dunn and Alderfer 2006). Participants' experiences with birds also were followed through their life-stages, describing patterns and processes of the trajectories of their experiences with birds (Chapter 3, 4 and 5). This focus is consistent with phenomenology, at least the way it is commonly employed in health and childhood studies (van Manen 1997; Creswell 2007).

As an exhaustive method of data collection, ethnographic interviews can address the entire lifespan of participants (Hammersley and Atkinson 2007). I used this tool to extensively explore participants' lives and intensively document their encounter with birds. Consistent with phenomenology, I initiated each interview informing participants with complete transparency about the purpose of the research, including the notion of roots-and-routes; and then prompted participants to express their personal views and thoughts of how social, cultural and environmental factors affected their experiences with birds (see Davies 2008; Feld 2012). The interviews also asked participants about the place where they were born and—from then until now—inquiring about meaningful experiences with birds. Accordingly, the change of place or immigration was not isolated from participants' lives as an exogenous or anomalous stage. In this way, participants described experiences, feelings and circumstances in great detail. I revisited unclear issues during follow-up sessions (see details of the interview in section 3.1).

Between 2012 and 2014, I interviewed 26 Latin-Americans who had recently settled in Canada and the U.S.A. (1-6 years of residency). After obtaining ethics clearance (University of Waterloo ORE # 19166), I recruited participants who were interested in birds before they emigrated (e.g., birdwatchers, naturalists, and educators), using announcements on birding-related internet social networks, direct contact with participants in the field (e.g., at birding sites), professional social networks, and snowball sampling. I selected participants who were interested in birds to improve the

reliability of their reports and accounts about bird species (e.g., Bang et al. 2007; Buizer et al. 2012; Vanwindekens et al. 2013). Men and women were equally represented in the sample (12 women and 14 men) and the sample was kept at a manageable size to allow for deep interviews (Creswell 2007). The interviews were conducted in Spanish (by Skype, telephone, or in person) and were congenial and interactive. When possible, I also conducted participant observation while birdwatching in southern Ontario, Florida, and Colombia to expand my own knowledge of bird species and interact with participants in situ.

In their new places, participants represented low- to mid-income immigrants (e.g., graduate students, professionals in their first jobs), while in their places of origin they represented a more diverse spectrum of rural, urban, and economic livelihoods. They also represented contrasting biogeographical regions and cultural landscapes in both roots (8 countries) and routes (10 provinces/states). I consider this contrast between roots-and-routes to be an interesting source of results and participants were open to deliberately offer their own reflections about the factors that influenced them. This reflexiveness of participants was an excellent source of verification appropriate to phenomenology.

Having achieved a consistent design and an intensive data collection method, I nonetheless used different data processing and analysis tools in the chapters. In general terms, I followed a qualitative data analysis strategy (or spiral analysis, Creswell 2007) that considers the iteration and customization of the research "phases" of data collecting, analysis and writing process. The data analysis in Chapter 3, for example, focuses on the bird species that compose participants' experiences with open and prolific code generation from participants' bird meanings in roots-and-routes. Using the roots-and-routes scheme, I center attention on the immigrants' experience, separating places, species and their meanings in roots-and-routes. I also sought species that participants recognize as providing connections between roots-and-routes. In parallel, I draw connections within the results primarily using explicit testimonies from participants, but also using mind-maps with hyperlinks (Chapter 3). I used key direct quotes to support and explain the elaboration of models of place-making with birds.

With the methodological objective of achieving participant reflexiveness during interviews (Davies 2008), I ethically committed to transparency in informing participants about concepts (e.g., roots-and-routes) and methods, including the introduction of the interview and the information letter. For some qualitative researchers, this approach can be problematic because informing participants can prompt

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specific responses and create research artifacts (see Creswell 2007). However, after introducing the interview, I asked participant to openly "tell their story and when birds started to appear in their life." In this sense, interviews were unstructured as participants led the narration of events. This openness help to documented not only positive relationships with birds, but also negative or null associations (see Chapters 3 and 4)

Chapter 4 vividly brings forth the voice of participants, whereas in Chapter 3 birds spoke for them. Chapter 4 emphasizes the meaningfulness of participants' experiences with birds through their life-stages. For each life-stage, social and ecological factor were intensively coded and analyzed. For this reason, quotes were often used as the main source of results and data verification. Conversely, Chapter 5 has its own data source and methods, namely an autoethnography of my own memories with birds. Autoethnography is an innovative research method, for this type of inquiry, where the life of the author is researchable in consideration of his or her position in the research problem and its broader social and ecological context (Chang 2008). As with any other qualitative research, autoethnography has its own set of precautions, including the need to avoid self-indulgence or self-righteousness (see Hammersley and Atkinson 2007; Davies 2008). These premises include the ethical principle of protecting the privacy of people participating in personal narratives or stories (Tolich 2010). In this chapter, I innovate by introducing a new analytical tool, called a culturegram-timeline, which I will describe in the chapter and in the conclusion of my dissertation. The writing style of this chapter is different from the rest of the dissertation, combining narrative-descriptive and analytical-interpretive styles to present results and draw connections with the literature. This combination serves to improve generalizability and validity through a triangulation of memories (as data) together with pictures, documents, and theoretical concepts (see Chang 2008; Davies 2008).

1.7   Organization of this work

This dissertation adopted the manuscript format allowed by the Department of Environment and Resource Studies at the University of Waterloo. In addition to this introduction, and a final concluding chapter, the bulk of this work is in the form of four research papers (Chapter 2 to 5). This introduction presented the two main bodies of this research, representing the intersection between biodiversity and mobility using the Anthropocene as a general context. In this sense, the introduction intends to represent the "gestalt" of the research or the "whole," whereas each research chapter is a journal manuscript targeting specific audiences. Although each manuscript chapter is nested in the same general research design and approach, they differ in terms of their methods, analytical tools and

intended audience. Each chapter has been (or will be) submitted to a peer-reviewed academic journal for its review and publication. In what follows, I briefly comment on the general objectives and content of each research chapter, with the purpose being to help readers to frame each paper in the context of the big picture of this doctoral work.

Overall, the structure of this dissertation allots to each chapter a function with respect to the general research purpose and objectives (Figure 1.2). Chapter 2, functioning as a "rocket launcher," offers a synthetic review of the research problem to position it within scholarly debate about the Anthropocene and novel ecosystems. Chapters 3 to 5 contain the empirical core of the dissertation and address different questions about the intersection of human mobility and biodiversity. The final chapter synthesizes the major findings, remarks and recommendations. As mentioned in the methodology section of this introduction, these chapters differ in their approaches, analysis and audience.

1.7.1   Birds and people in novel socio-ecosystems

Chapter 2 provides the operational framework of novel socio-ecosystems to better integrate humans into a consideration of expanding the concept of novelty in the Anthropocene. The chapter calls for an extension of the idea of novel ecosystems (sensu Hobbs 2013) to incorporate a better understanding of their social dimensions in a manner consistent with the scenario of accelerated human mobility and immigration. This manuscript is written for an interdisciplinary "socio-ecological" audience, deeply rooted in the field of ecology, and its short length reflects word count limits for appropriate target journals in this field. This chapter proposes that novel ecosystems need to be re-conceptualized as novel socio-ecosystems, by shifting the focus from primarily the study of "natural" non-human systems to include human beings actively participating in ecosystems of the Anthropocene. This approach calls for the integration of two important notions—Multinaturality and Multiculturalism—to understand the phenomenon of novelty to a greater extent.

The paper analyzes the literature describing the role of humans in novel ecosystems and thereby articulates the arguments for integrating complex human dimensions of novelty. The utility of this framework is elaborated through two case studies of novel socio-ecosystem units and variables. The first case reviews the introduction of the American beaver (*Castor canadensis*) in southern Patagonia to explore changing social perceptions and the generation of social novelty. The second case study introduces this research to a conservation audience, with a snapshot of the relationship between Latin-American immigrants and birds in North America (as explored in subsequent chapters of my

dissertation). This case studio emphasises social novelty with respect to how immigrants relate to birds in their new places, and how the birds can represent a wide range of ecological, cultural and social situations. Both cases shift the role of human beings in ecology from being merely a disturbance to full participants, which helps to improve the integration of social-ecological research in the Anthropocene.

1.7.2 Feathered roots-and-routes

Chapter 3 explores the role birds play to people's emotional and psychological adjustments to new surroundings. Following the place framework of roots-and-routes (Gustafson 2001), it extensively documents birds that participants associate with their former homes in Latin America as well as their new life in Canada or the U.S.A. These associations were understood as meanings, insofar as participants explicitly reported the significance of these bird species as conspicuous place features or as part of their experiences. For instance, participants reported that birds are associated with meanings that came from either bird habitat or behaviour or the significance of the birds in terms of their own experiences, values, and achievements. Using both types of meanings, I describe the role of birds within the process of place- and identity-making between participants' roots-and-routes. In short, birds help immigrants to adjust their worldview through a recalibration process, with birds acting as point of references connecting roots-and-routes. The chapter ends with recommendations for how an understanding of this process and its integration in education programs can help to engage people with local issues of bird conservation.

This chapter is written for an interdisciplinary conservation audience of natural and social scientists. The use of ecological terminology provides access for natural scientists to the central research problem of the interaction between biodiversity and human mobility. I conceive birds as having social functions along with the ecological ones that are well understood by biologists and ecologists at all levels. For example, I propose a classification of birds by their role in place recalibration, which can be used as a model for future research. This chapter introduces to social scientists the use of ornithological information in association with the human experience of place, in which the framework of roots-and-routes advances the integration of both biodiversity and mobility within the place literature.

1.7.3 People, birds and life-stages

Chapter 4 conceives the human-bird relationship as an active and concrete process with trajectories and dynamics affected by ecological and social drivers. In this chapter, I study the life progression of

participant-bird relationships, contrasting factors and drivers affecting these relationships during childhood, adolescence, early adulthood, mid-adulthood, and immigration. For each life-stage, I build models that employ these factors and drivers to explain fluctuations in the meaningfulness of birds in the life of my participants. For example, in association with other factors, socialization through childhood play in nature was the most significant driver for bird-human relationships during childhood. I conclude by discussing the active role of socialization and human agency in nature and by providing recommendations for facilitating experiences of youth and immigrants in nature.

This chapter uses the writing style of typical qualitative studies. Examining participants' life-experiences, its style is similar to education and health studies conducted with children and immigrants (van Manen 1997). This chapter consistently uses quotations to support claims and the results are presented in a chronological order. The audience of this chapter is more restricted to environmental social scientists, although its narrative is meant to be accessible for researchers in general.

1.7.4   Birds, memory and identity

The autoethnography in Chapter 5 represents the final stage of four years of research about birds and immigration. It also reflects my life experiences with birds in Chile and my four-year journey in Canada. Over the past several years, I have continuously and opportunistically collected data from my memories and experiences with birds in Chile and Canada. For such a task, I followed data storing, organization, triangulation and verification techniques described in manuals of autoethnography (Hammersley and Atkinson 2007; Chang 2008; Davies 2008; Tolich 2010). The findings from this chapter are intertwined in a personal narrative and illustrated with pictures of key moments, places, and bird species from my personal image bank.

As a researcher, autoethnography was a fascinating discovery. It provided the opportunity to integrate concepts, approaches and findings from the previous chapters to my own personal experience. In this chapter, I narrate my experiences of recalibration of place with my significant species and the circumstances and events that made them meaningful. These birds-events-memories became units of study, conceiving my memory as an active and researchable process. Using this approach I innovate with the use of analytical devices and the integration of Latin American philosophy through the concept of biocultural memory (Toledo and Barrera-Bassols 2008). These innovations and integrations provide a feeling of emancipation not only from colonial schemes of academic research, but also from attachment to the scientific objectivism that otherwise limits the use

of personal memory, experiences, roots-and-routes. This concept helps me to bridge conceptual gaps between findings in previous chapters and the literature (e.g., place and animals). In the context of the research, I proposed biocultural memory as a unique and distinct incorporation of birds as more than social constructions to people's life.

1.7.5 Conclusions

The conclusion (Chapter 6) of my dissertation finalizes this work by bringing together its theoretical, empirical, methodological and practical contributions. Using these categories, I organize the contributions of each chapter, showing the overall intention and structure of the research. Together with the main conceptual advances, this section answers the research questions about the role of birds in the sense-of-place and life of recent immigrants and how these findings can contribute to human-nature research in intersection with human mobility and biodiversity in the wake of the Anthropocene. This synthesis seeks to revisit the contributions of this research to the reader to provide an overall understanding of its significance.

Chapter 2

Novel socio-ecosystems: Re-conceptualizing humans as participants in novel ecosystems

2.1 Abstract

Ecologists are seeking effective ways to integrate humans into the study of ecosystems and have achieved important advances in theory and practice. Recently, recognizing the role of humans as a main driver in ecological change, ecologists coined the term "novel ecosystem" to emphasize the modified composition and function of many ecological assemblages. Yet, to date, this concept has not considered the breadth of social dimensions that may encompass the Anthropocene. I propose that re-conceptualizing humans as participants in "novel socio-ecosystems" will encourage ecologists to operate within a more integrated system to better address complex interdisciplinary challenges. This framework is illustrated with two novel human-nature systems: i) birds as part of the sense-of-place for Latin American immigrants to Canada, and ii) social implications of introduced beaver in southern Latin America. This work advances on previous calls to integrate conceptual and methodological approaches in ecology given accelerating global ecological and social change.

Keywords: Social-ecological change, novelty, sense-of-place, human dimensions.

2.2 Introduction

Humans have become the major driver of global biophysical processes, leading some to conclude that we have entered a new geological epoch, the Anthropocene. Accordingly, ecological research has broadened its focus from primarily the study of "natural" systems to include those heavily impacted by human activities, such as agricultural and urban systems (Pickett et al., 2001, Panel 1). Ecologists have also proposed several concepts to connote the novelty of the planetary biota at several scales, including anthropogenic biomes and non-analog communities (Williams and Jackson 2007; Ellis and Ramankutty 2008). Among these concepts, the term "novel ecosystem" has gained great momentum among ecologists because it directs attention to the ecological units that emerge at the human-nature interface (e.g., heavily impacted land) and that cannot reasonably be restored to a prior, sometimes hypothetical, historical or "natural" state. In general, novel ecosystems differ from their antecedents in terms of species composition (e.g., native and exotic species) and/or ecological processes or functions (e.g., biogeochemical cycling). It has also been estimated that they cover between 28 and

36% of Earth's terrestrial surface and an undetermined portion of coastal areas and oceans (Hobbs et al. 2013). Despite recent critiques refereeing to the broadness or imprecision of this term (Mateos et al. 2013; Aronson et al. 2014; Simberloff et al. 2015), the concept of novel ecosystem examines the process of ecological novelty, not as a 'new' phenomenon for the biosphere functioning, but as a process that is increasing at a rate and speed never seen before in the current geological epoch (Lewis and Maslin 2015).

The Anthropocene has been used to dub our modern age of accelerated human-driven ecological *and* social change. Although the novel ecosystem concept explicitly acknowledges the extent to which humans have modified ecosystems, in discourse and in practice it does not fully recognize the place of humans in these systems. For example, There is a sharp increase in the number of publications using the keyword "novel ecosystem*" from 2006 to 2013 (n = 134 articles, Web of Science), but fewer than 10% of these articles addressed human dimensions beyond the implicit role of humans as drivers in the creation of novel ecosystems (n = 10; research domain = social science and humanities, as of November 18th, 2014). Although the term "novel societies" has not yet been coined, social scientists are already investigating similar theoretical and methodological complications in the human domain, addressing the effect of human mobility, multiculturalism and cosmopolitanism within "super-diverse" societies in the current era of change (e.g., Chryssochoou 2000; Vertovec 2007; Cresswell 2011). In these natural and social scientific bodies of literature, there are interesting parallels between the processes and properties of ecological and social novelty. In what follows, I synthesize and situate the type of research being conducted on the human dimensions of novel ecosystems. I then evaluate how the novel ecosystem concept is used at present and how it might be expanded to more fully encompass both the environmental and human dimensions of novelty.

2.3 Bringing the human dimension into novel ecosystems

To date, research on the human dimensions of novel ecosystems has been restricted to conceptual debates within the realm of restoration ecology, yet only a few articles have addressed specific empirical questions in the social domain (e.g., Buizer *et al.* 2012). From restoration ecology's management-centered approach, we can recognize two specific ways in which humans are conceived within novel ecosystems: as "drivers" (e.g., Gardner *et al.* 2009) that cause changes or as "judges" that determine the fate of novel ecosystems and their restoration (Hobbs et al. 2011). However, drawing from recent conceptual advances within urban ecology (Standish et al. 2012), I propose that

these traditional categories limit ecologists' ability to fully conceive and address the roles of humans in ecosystems.

Extant categories treat society as if were stable, therefore ignoring the rapidity of contemporary social change and the presence of contested interests and standpoints, including underlying ideas of nature (Buijs et al. 2009). In contrast, other applied ecology fields, including wildlife management and invasion biology, have been expanding both theory and empirical study to include social dimensions related to change, disparity, and values (e.g., Teel *et al.* 2007; García-Quijano *et al.* 2011). Likewise, an increasing number of interdisciplinary academic fields, such as political ecology and geography, have sought to explicitly integrate the environmental social sciences into applied ecological research (Ogden et al. 2013).

For some time, ecologists have been at a crossroads in the development of new frameworks to deal with the social factors involved in understanding and sustaining biodiversity and ecosystem services (Collins et al. 2011), and environmental managers too face the urgent challenge of an increasingly demanding society (Carpenter et al. 2012). However, far from being a simple additive process of compiling more social variables that influence ecological processes, new proposals require the consideration of drivers of social change (e.g., transnational immigration) within coupled socio-ecological systems beyond the role of humans assigned as perturbation (Collins et al. 2011) . This interdisciplinary frontier must engage with complex social dimensions, such as human mobility and globalization (Buijs et al. 2009), if it is to adequately integrate social dimensions into the study of ecological novelty.

2.4 A framework for novel socio-ecosystems

Ecologists have begun to explore novel ecosystems because of their emergent properties related to species diversity and ecological processes and the fact they are widespread in terrestrial, freshwater and marine environments. They typically present a cosmopolitan species assemblage, including taxa that were historically present at the site and species introduced or dispersed from elsewhere (Hobbs et al. 2013). Consider the description of the Hawaiian rainforest by science journalist Emma Marris (2009): "[t]he jungle is lush, humid and thick with mosquitoes. It is also as cosmopolitan as London's Heathrow airport," being constituted by introduced trees such as mango (*Mangifera indica*), Queensland maple (*Flindersia brayleyana*), and strawberry guava (*Psidium cattleianum*). What this description omits, however, is that the archipelago's modern-day human population is also

cosmopolitan, just like its forests. In fact, 18% of Hawaiians are foreign born, and they originate from diverse source regions including Asia (77.7 %), Oceania (10.3%), Latin America (4,8%) and Africa (0.7%), with major contributing countries being the Philippines (46.3%), China (8.8%) and Mexico (2.1%) (Migration Policy Institute 2014). In addition, contrary to the image implied by the metaphor of an international airport, these people and trees are not just transients, but instead actually *live* on the island, as a combination of ancestral/historical and recent immigrants (and their languages).

More generally, planetary-scale drivers like transnational human mobility have greatly modified the composition of human societies since World War II (Vertovec 2007). The situation of shared social and ecological novelty, then, can be found globally, being clearly evident in industrialized countries with multi-ethnic cities, such as Toronto, Auckland or Singapore, where up to 40% of the population is foreign born (UN-Habitat 2004). In Canada, for example, more than 200 ethnic groups were reported by respondents to the 2011 National Household Survey, with the majority of groups concentrated in the southern portion of the province of Ontario (Statistics Canada 2013). At the same time, this same area is classified ecologically within the mixed wood-plains ecoregion, yet forests of this type remain quite scattered, covering only 10% of the landscape, which is actually dominated by a matrix of agricultural lands (78%) and cities and roads (7%). Most of its wetlands have been drained and converted to agricultural land and cities. The resulting landscape contains a variety of unprecedented types of habitat, ranging from heavily urbanized and industrialized to more vegetated areas (Crins et al. 2009). Although it is unclear how humans interact with this novel ecological context, we know that the social matrix is also complex, including First Nations peoples, the descendants of historical colonizers, second- and third-generation Canadians and recent immigrants.

Rather than a simple case of equivalency between ecological and human cosmopolitanism, the integration of social novelty into the study and management of ecosystems requires new approaches and tools. Environmental managers concerned with the continuity of ecosystem function, for example, also need to think about new forms of institutions and governance (Ogden et al. 2013). In this context, once ecologists recognize that societies are not static, culturally homogenous structures, we can be better prepared to work with researchers and approaches from the social sciences and perhaps better implement integrated research and effective actions that address the dimensions and scales at which socio-ecological phenomena actually occur (Figure 2.1).
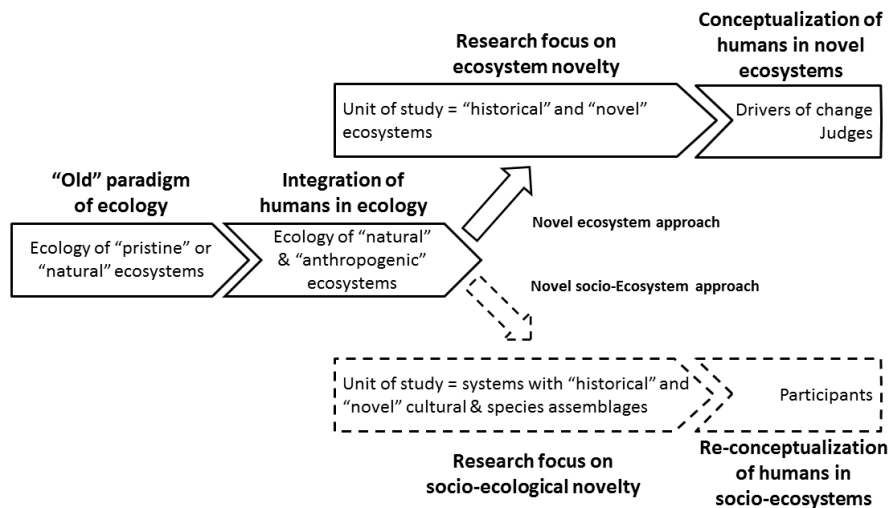
Figure 2.1 The holistic integration of humans into ecology requires an extension of the discipline's scope from a traditional emphasis on "natural" ecosystems to socio-ecosystems. This reconceptualization of the human-nature study unit requires accompanying changes in research questions, methods and design. While ecologists largely conceive humans as drivers and judges of novel ecosystems, this framework propose that they would be better and more usefully thought of as participants in novel socio-ecosystems.

To implement a novel socio-ecosystem framework, researchers need to consider novel social and ecological features simultaneously. Two insightful concepts from the field of geography help to highlight these dimensions: "multinaturality" and "multiculturalism" (see Lorimer 2012). The former refers to the co-occurrence of multiple non-humans components that conform ecosystems, each having its own different trajectory or evolutionary origin. Humans may have contested values and perceptions regarding each of these components, as well. In this sense, the concept of novel socio-ecosystems very clearly indicates that multiple species assemblages are possible for a given ecosystem. Some of the species present originally evolved alongside other species found in other natural systems and biogeographic settings, where these species assumed specific trophic positions and may have carried out important ecological functions. Since their introduction or arrival, these more recent biotic components are continuously interacting with historical species, adapting to local and global ecological changes, and sometimes re-organizing their 'adoptive' ecosystems. In addition, migratory species seasonally interact with resident species in these communities (Rogers and Chown 2014). On the other hand, multiculturalism refers to a similar pattern in the human components of

socio-ecosystems, including their diverse languages, cultural traditions and institutions that also may have arisen separately or together, having their own trajectories and origins (Vertovec 2007). These human and non-human species, however, now share (and many of them have shared for several centuries) the same environmental contexts, having become unique and diverse multinatural and multicultural entities (Figure 2.1).

2.5 Scenarios, case studies and variables to explore novel socio-ecosystems

Once ecologists have recognized the shared social and ecological novelty of a place, they can focus on studying the interactions between these human and non-human components and their consequences. In this sense, we can acknowledge and address the components' differences (i.e., in terms of multinaturality) without discriminating or isolating species (or humans) *a priori* by their origins (Figure 2.1). The unbiased study of ecological interactions—without the "native *v/s* exotic" label—is the first step required to conduct research on current human-nature relationships that may be novel and therefore not previously foreseen. Subsequently, we can design research in novel socio-ecosystems, extracting the specific cases and variables of the study as coupled human-nature units (Collins et al. 2011).

The concept of novel ecosystems can be reconceived to emphasize previously underappreciated human dimensions of ecosystem novelty. This is important given that these human dimensions can be as great as the non-human ones. Furthermore, these aspects are interwoven, and therefore, I propose to reframe novel ecosystems as "novel socio-ecosystems." Such a focus would allow ecologists and managers to perceive that societies, like species assemblages and habitats, are non-static entities affected by and affecting global change. In the following analysis, I first justify why novel ecosystems are actually socio-ecological units of study, and then I discuss scenarios that help to delineate the relevant variables of study.

PANEL 1: Humans and ecosystems: A contested history

Ecology has regarded the integration of humans in ecosystems in divergent ways through its development (MacIntosh 1985). Understanding this history is critical to ecological research in the Anthropocene, as paradigmatic shifts and re-conceptualizations of humans' role in ecology drive subsequent changes in research priorities and practices (Figure 2.1). During the modern consolidation of ecology as an academic discipline, some founders claimed the necessity of undertaking the study "of man and nature as a unit, not separately", going further to affirm that ecology should work to integrate itself with society and human values (Odum 1953). In spite of these seminal calls, the early adoption of the Clementisan "balance of nature" paradigm and the search for "climax communities"

pushed ecologists to study ecosystems with as little impact as possible from modern humans, thereby minimizing the historical and modern relevance of humans in ecosystems and restricting their role in ecological research to the interpretation of biological data (MacIntosh 1985).

Yet, beginning in the 1970s, social awareness of environmental deterioration revitalized a number of initiatives to re-integrate humans into the study of ecosystems. By the 1980s, the Ecological Society of America's (ESA) Sustainable Biosphere Initiative formally legitimized the role of ecology as the study of the interface between ecological processes and human social systems (Lubchenco et al. 1991). Furthermore, in this same period, Pickett and Ostfeld (1995) identified a "new" ecological paradigm, in which ecosystems were conceived of as dynamic, open systems that explicitly include humans.

In the 21st century, new global databases and long-term perspectives led ecologists to hone in on the impact of accelerated global change in ecosystems. These changes were associated with strong anthropogenic drivers, and once more, ecologists further separated themselves from the traditional emphasis on "pristine" ecosystems. However, in addition to recognizing the rapid and unprecedented scale of ecological change, ecologists also began to recognize "novel ecosystems," new assemblages of native and exotic species that display emergent ecological functions unlike their natural historical analogs (Hobbs et al. 2013).

To date, ecological research and debate about these new study units has been biased towards non-human dimensions. The role of human beings in novel ecosystem is still ill-conceived, typically relegated to merely drivers or judges of novel ecosystems in a traditional management-centered approach (Figure 2.1). We propose that humans should instead be conceived as "participants" in ecological novelty, to encourage more careful attention to the bi-directional relationship between humans and nature. By integrating humans as participants, we can conceive novel ecosystems as socio-ecological units that are multinatural and multicultural (see text). In this sense, instead of thinking about what an ecosystem *should be*, we suggest that novel ecosystems integrate multiple natural *ways to be*. In the same fashion, humans are not unique as a source of ecological disturbance, but are instead participants in ecosystem novelty under the changing scenarios of the Anthropocene. Nonetheless, this acceptance principle does not relieve us of the task of thinking about what how we might identify 'more' and 'less' desirable configurations of socio-natural systems, but it shifts our focus from restricting particular components to co-produce more resilient , welcoming and sustainable approaches given the already state of change (Hinchliffe and Whatmore 2009).

Several scenarios can be conceived for such case studies. A first and perhaps conventional way is to study the interactions between long-term residents and newcomers, including those catalogued as invasive exotic species (Panel 2). Concretely, we can examine social novelty in the incorporation of recently introduced species in material culture, traditional practices and the creation of new relationships between human residents and introduced plants and animals (e.g., Canadian beavers in remote southern Patagonia, Figure 2.2., Panel 2; Pfeiffer & Voeks, 2008). A second approach would be to explore the new relationships forming between human immigrants and local biodiversity (e.g., Latin American immigrants' experiences with local birds in Canada, Panel 3). Thus, human immigrants may be encountering local species for the first time, or perhaps some species represent ties with "home," such as cosmopolitan birds and plants (e.g., Jerolmack 2007; Figure 2.3). Finally, a

third perspective could emerge from the intersection between the other two scenarios in which interactions occur in an integrated multinatural/multicultural landscape.

Novel socio-ecological interactions are particularly apparent in urban settings like public parks, neighborhoods and community gardens (Jerolmack 2007; Buijs et al. 2009). In these emergent human-nature systems, humans actively transform their environments, but also confront diverse socio-historical and political contexts. There is also evidence that humans develop novel practices and relationships with species in non-urban contexts or in situations in which the urban-rural separation is weakly delimited. For example, in a study of residents' attitudes towards introduced green iguanas (*Iguana iguana*) in Puerto Rico, García-Quijano *et al.* (2011) found that social reactions to iguanas were heterogeneous, ranging from the identification of the iguana as a symbol of the local landscape to its vilification because of its physical appearance and impact on local birds. Most interviewees, however, disagreed with lethal control measures because iguanas were considered to have become charismatic residents of this novel socio-ecosystem. In other cases, traditional communities incorporate new technological tools into their ancestral practices with wildlife. The Maori in New Zealand, for instance, have adopted new practices in the traditional harvest of a shearwater, *titi* (*Puffinus griseus*), reconfiguring their belief-practice-knowledge system to sustain both ancestral cultural meaning and the shearwaters' population (Moller and Kitson 2009). Similarly, North American birding is today a century old socio-ecological practice, but continuously adopts new technologies, including most recently, interactive internet databases and mobile applications that support citizen science (see Cornell Lab of Ornithology's www.ebird.org). These examples illustrate social novelty in the way that humans, regardless the cultural context, integrate nature into their life-system using technological innovations. This human-nature interaction reinforces alternatives of the conceptualization of nature and socio-ecosystems as Technonatures (see Chapter 1, Appendix A).

PANEL 2. More than an ecosystem engineer: Invasive exotic beavers in southern Patagonia
In the 1940s and 50s, governmental and private initiatives introduced various species to Tierra del Fuego in southern Patagonia, including Canadian beaver (*Castor canadensis*), American mink (*Neovison vison*), muskrat (*Ondatra zibethicus*) and European rabbit (*Oryctolagus cuniculus*). The re-construction of southern Patagonia's landscape in the image of the northern hemisphere was largely due to a cultural mindscape that valued these species over native ones to "enhance" the fauna, "develop" the region and "bring progress" to a remote area. Beginning in the early 2000s, there have been a suite of ecological studies about these species, with a strong bias towards the quantification of impacts, particularly for emblematic species like the beaver (Anderson and Valenzuela 2014).
  This first generation of research on the beaver as an "invasive ecosystem engineer" improved knowledge of both the introduced beaver population and the region's ecology. The subsequent communication of this knowledge with decision-makers helped to motivate the signing of an

agreement between Argentina and Chile to eradicate beavers and restore affected ecosystems. Ecologically, beavers were shown to be the cause of the largest transformation of sub-Antarctic forests in the Holocene, perhaps marking the beginning of the Anthropocene in this biome. As ecosystem engineers, they physically modify both in-stream and riparian habitats, which reorganizes biotic communities and alters ecosystem processes. For instance, beaver meadows and ponds facilitate the spread of other exotic flora and fauna, yet they also provide habitat for native waterfowl and fish. The forests of southern Patagonia, however, are evidently not resilient to beaver impacts, and therefore will require active restoration measures to achieve the desired outcomes enunciated in the binational treaty (Wallem et al. 2010).

   Nonetheless, beaver invasion in southern Patagonia is not merely a story of humans driving biotic changes that resulted in ecological novelty. Global images of Patagonia tend to project it as an unsullied wilderness, but it has a long history of human inhabitation and a complex socio-cultural context. For example, while the Tierra del Fuego Archipelago is one biogeographic unit, it is administered by two nations with different politico-administrative systems. Furthermore, agrarian reforms on the Chilean side of the island led to about twice as many ranches with half the average size of the Argentine properties. Plus, while environmental managers in southern Patagonia rank invasive species as a primary threat to ecosystems, residents of both Argentina and Chile generally do not perceive them to be a problem (Zagarola et al. 2014). Indeed, in this social context, the beaver has become a symbol for various tourism enterprises and companies, particularly in Argentina (Figure 2.2). Incorporating these and other social factors into our understanding of the phenomenon of biological invasions and restoration ecology is the goal of the ECO-Link project (www.ecolink.frec.vt.edu). By addressing the issue as a novel socio-ecosystem, it is hoped that more integrated and applied questions can be answered, such as whether a historical lack of participation by landowners in ecosystem management initiatives addressing, in this case, the effects of beavers in the structure and function of ecosystems. Until now, landowner participation had been encouraged by via a broken skin-payment incentive that does not account for feedback between underlying social perceptions on beavers and ecosystem service delivery of the Patagonian forest.

   Each of these examples illustrates a combination of novel social and ecological characteristics from an emerging, dynamic and changing system. These examples also confirm that humans not only drive ecosystem change, but also take part in novel habitats around the world. Indeed, in most places where humans live, novel ecosystems may represent the closest thing to "natural historical environments" that people know and that provide both environmental and cultural ecosystem services. In this sense, novel socio-ecosystems can be a way to (re)connect an assorted diversity of people (urbanites, immigrants, ancestral inhabitants) with nature and provide an ethical and emotional connection that has well-known psychological benefits. These aspects should constitute specific variables of study that can bring concrete social science methodologies to the study of complex systems, such as measuring social constructions like sense-of-place and connectedness to nature, instead of decontextualized perceptions or preferences (Mayer and Frantz 2004). As such, social novelty can simultaneously reinforce and also modify existing relationships and perspectives of nature (Buijs et al. 2009), but what must be stressed for ecologists is that the change and the connections are

reciprocal between the social and the ecological systems. This means that while we merge societies and ecosystems as units of study, we are reminded that they are more than the sum of the factors that drive their change (Figure 2.1).

Figure 2.2 Castor Cook, a former restaurant in Ushuaia, the world's southernmost city in Argentine Patagonia. It is of note that this commercial enterprise adopted not only the invasive exotic North American beaver (*Castor canadensis*) as part of its identity, but also blended Spanish and English (*castor* = beaver in Spanish), demonstrating the social interaction between local residents and cosmopolitan species and languages. Photo credit: A.E.J. Valenzuela.

PANEL 3. The relations between immigrants and birds in novel socio-ecosystems
As European immigrants settled around the world in the early 19th century, their relationships with other species provided a foundation for their developing sense-of-place. During the creation of new nation-states, local species became strong symbols of identity to people having multiple origins. Later, in the 20th century, these species helped to stimulate conservation initiatives, with the concept of "nativeness" becoming a focal point of nation-level environmental conservation (e.g., Aslin & Bennett, 2000). In the 21st century, the story is changing. Due to rapid human mobility and successive voluntary and involuntary introductions of animal and plants, modern ecosystems now comprise an unprecedented mix of humans and non-human species from various and often distant places. A person's identity is now less likely to be anchored in one specific place, and his or her ability to distinguish between native and exotic flora and fauna has been reduced. In this new context, the role that species play in 21st century immigrants' identity and sense-of-place remains largely unexplored, generating questions about how they and the communities they build in new lands mirror the novelty of increasingly globalized socio-ecosystems.

Among the members of the animal kingdom, birds in particular can be an important subject for investigating the "roots-and-routes" of people and their environmental relationships. With regards to the former, birds can represent our roots, our origins and first experiences with nature, because they inhabit a wide variety of places, ranging from the wildest areas to the most populated cities; they are therefore part of our material and symbolic culture (Tidemann and Gosler 2010). Moreover, they also embody a range of complex socio-ecological interactions from extremely utilitarian, such as high-tech domesticated birds (e.g., battery hens) to almost entirely heraldic sacred animals or national symbols, such as the Andean condor for countries and cultures all along the Andes Mountains. In between these extremes, birds can be poorly known endangered and even extinct species (e.g., the Eskimo curlew, *Numenius borealis*), unwanted guests or invasive species (e.g., the European starling, *Sturnus vulgaris*, and monk parakeet, *Myiopsitta monachus*), or cosmopolitan urban dwellers that are often simply ignored (e.g., house sparrow, *Passer domesticus*, and rock pigeon, *Columba livia*). Moreover, because of their ability to fly, many birds can seasonally migrate long distances, thereby uniting continents and connecting biomes and ecosystems. Birds provide a wide selection of geographical and socio-ecological connections that allow humans to encounter them wherever they go, meaning that birds also represent the routes humans have followed in their lives. Theses human-birds routes may provide connections from place to place, including encounters with the exact same species (migratory, cosmopolitan or/ and wide-range birds) or species that evoke a "sense-of-place," due to their equivalence on behaviour or ecological role with species of "home" (e.g., caracaras and crows, both close-human inhabitants, gregarious and scavenger birds).

Many of these roots-and-routes relationships with birds remain unexplored. However, practices with birds in novel socio-ecosystems (see text), such as or birding and pigeon-keeping, may favor intercultural interactions in which pigeons and neotropical migrants can represent the ethnicity of the practitioners and inspire transcultural interactions among people who have similar traditions in their cultural background or simply are willing to integrate in a friendly and healthy manner (Jerolmack 2007).

As such, birds can provide a link between one's past and present life and connection among several ecosystems. In these ways, birds embody roots-and-routes. Studying the relationship between human immigrants and birds may help to better understand the connection between people's identities and places, integrating novel socio-ecosystems as participants. People can encounter birds that inspire memories about the past, observing what birds they know, do not know, and even birds, such as "sea gulls" that seem to be present everywhere but, at the same time, look different in a new context or place (Figure 2.2). These links and connections are key psychological and social aspects of global change that need to be integrated into research, as well as considered in environmental education programs that seek to integrate immigrants in their new homes.

Figure 2.3 The sea gull, a ubiquitous resident in numerous ecosystems, is pictured here posing for tourists and new Canadians in Niagara Falls, Ontario. In this case, it is a ring-billed gull (*Larus delawariensis*), one of the most common birds in urban environments in North America. In the picture, however, it gains special notoriety among visitors and newcomers to the area, who have never taken the time to appreciate the bird in their everyday life.

2.6 Conclusions

During its development as a scientific discipline, ecology has conceived the role of humans in the environment in contested and variable ways (MacIntosh 1985, see Panel 1). Humans are now more widely accepted as a part of ecosystems (Pickett and Ostfeld 1995), which has led ecologists to adjust the units, cases and variables under study (Figure 2.1). Here, we introduce the framework of novel socio-ecosystems to link this trend with the recognition that not only the ecological component of ecosystems is novel, but also its diverse human constituents—and that both continue to change with time.

Understanding these units as multinatural *and* multicultural systems can help existing environmental research and decision-making models include more complex social dimensions, such as human mobility, sense-of-place and psychological well-being. By analysing the novel ecology of the Anthropocene, we observe that most of the unperceived effects of global socio-ecological change may be happening at a subtle face-to-face scale. In that regard, while scientists and decision-makers can identify policies and drivers that facilitate (or constrain) stakeholder participation, they cannot

claim to represent an ongoing changing society if they do not understand the intimate and reciprocal relationships between people and nature in the 21st century.

Broader multidimensional approaches are being developed using place-based strategies that consider human beings as "participants," rather than merely drivers or judges (Martín-López et al. 2014). However, it is important to keep in mind that sense-of-place and human mobility, as examples, are large bodies of knowledge in and of themselves, having divergent theories and methodological approaches (Scannell and Gifford 2010). Consequently, ecologists seeking to work at the socio-ecological interface need to be responsibly aware of their own conceptual and methodological limits as they reach towards this expanding frontier, which of course must ideally be reached in tandem with other academic disciplines and knowledge systems.

The novel ecosystem concept has effectively communicated to the environmental research and management audience certain underappreciated, but fundamental dimensions of human-nature dynamics in the Anthropocene. Although it has been recognized that people engage with ecological novelty and participate in reciprocal relationships with the environment, reinforcing the notion of people as participants could facilitate a more place-based approach to research and decision-making by including people who actually experience or inhabit these systems (e.g., Hobbs *et al.* 2013). Our expectation is that framing the issue in term of novel socio-ecosystems will serve to advance integrated socio-ecological research, highlight unappreciated social dimensions, and address previously under-explored topics of novelty in the Anthropocene.

Chapter 3

Feathered roots and migratory routes: Immigrants and birds in novel socio-ecosystems.

3.1 Abstract

Global social-ecological change poses a new challenge to human-nature relationships because it appears to threaten human sense-of-place by both accelerating ecological change and increasing human mobility. Here, this study examines the role that birds play in the sense-of-place of immigrants, documenting the interaction between people and birds as proxies of their place experience. In-depth ethnographical interviews were conducted to 26 Latin-Americans who settled recently in Canada and the United States. During the interviews, participants reported significant bird species, as well as specific associations between these species and place features and experiences. These species' associations were interpreted by the researchers as "meanings" and were analyzed contrasting and mapping participant' experiences in both their "roots" (places of origin) and "routes" (new places). Initially, an asymmetry was found in that participants mentioned more than twice as many bird species from their roots (n = 150) as from their routes (n = 70). However, this lesser subset of birds from routes signified key species (i.e., species favouring participant adaptation, n = 36) and linking species (n = 30) or shared birds between participants' roots-and-routes. Not only did this subset of birds comprise an interesting assemblage of North American, Neotropical and cosmopolitan species, it also mirrored ecosystem novelty in North America. Key species (e.g., Northern Cardinal and Blue Jay) and linking species (e.g., Osprey, House Sparrow) functioned as "points of reference" in helping participants "recalibrate" their sense-of-place and identity to their new places. Participants recalibrated "where they are" by connecting familiar/unfamiliar species by their territorial behaviour, vocalization or cultural meanings, and they recalibrated "who they are" using birds as means of self-realization in their new place. These findings support the argument that biodiversity within novel ecosystems already performs significant "social functions" for people adapting to new places.

Keywords: Social-ecological change, sense-of-place, ethno-ornithology, Anthropocene.

3.2 Introduction

Despite significant research charting the ecological value of biodiversity and its contribution to human well-being (Millennium Ecosystem Assessment 2005), we have made comparatively less

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progress unraveling the socio-cultural functions of biodiversity for its conservation and valorization (Winthrop 2014). Compared to the level of our existing ecological knowledge of plants and animals in ecosystems, we have been less attentive to studying the role species of plants and animals play coupled human-nature systems or socio-ecosystems that provide cultural ecosystem services (Carpenter et al. 2009; Collins et al. 2011). Moreover, once humans became a major geological force, rapid social and ecological change created a new scenario of uncertainty and novelty, to the extent that scientists are proposing a new geological era, the Anthropocene (Crutzen 2002; Lewis 2015). This era is characterized by increasing climatological and ecological change, and it is accompanied by an equally accelerated social change driven by human mobility, global markets and instant communication systems (Gidoomal 2003; Blunt 2007)

In the Anthropocene, the proposed new epoch in which human became the main driver of change (see Chaper 1-2; Lewis and Maslin 2015), the interconnectedness of social and environmental problems challenges the scale and extent we traditionally approach human-nature relationships (Steffen et al. 2011; Ogden et al. 2013). For example, the impacts of climate change in the human psyche and life-systems are a good example of how this challenge creates the necessity for interdisciplinary fields and frameworks integrating subtle human dimensions of our relationship with nature (e.g. Piguet *et al.* 2011; Essl *et al.* 2012; Fresque-Baxter and Armitage 2012). However, before the discussion of specific causes and consequences of global change, it is necessary to consider the way we conceptualize humans interacting with nature and *vice versa*, and the specific mechanism and relationships by which biodiversity could support human social and cultural life (e.g., Chapter 2).

As one example of this lack of clarity, the meaning of "culture" in the concept of ecosystem services is obscure. UNESCO (2002) defines culture as "the set of distinctive spiritual, material, intellectual and emotional features of society or a social group, [encompassing …] lifestyles, ways of living together, value systems, traditions and beliefs." Beyond recognizing basic common dimensions of culture in this way, UNESCO also recognizes and promotes cultural diversity both within and among societies. In contrast, the ecosystem services concept presumes that people from different cultures benefit from biodiversity through similar means defined by economic measures (Winthrop 2014). This assumption is problematic, because societies are as heterogeneous and dynamic as ecosystems (Chapter 2), and people from different cultures vary in their relationships to biodiversity and the benefits they obtain from it (Buijs et al. 2009). If considered at all in biodiversity studies, there is a tendency to conceive cultural backgrounds as monolithic categories (e.g., Chinese culture or

European culture), ignoring the fact that cultural relationships with nature are not uniform within nations, cultures or regions, and may also evolve and adapt to changes (Given 1995; Teel et al. 2007). These shortcomings suggest a limited empirical basis for reflecting on the way the human mobility as a social dimension of the Anthropocene may redefine human-nature relationships (Steffen et al. 2007; Lorimer 2012).

There is a similar disciplinary issue in the way social scientists conceptualize 'nature' (as a set of non-humans beings). Environmental psychologists, geographers and sociologists have studied how the natural environment is entangled with complex human dimensions, such us psychological well-being, happiness and sense-of-place (e.g., Karst and Nepal (in rev.); Ryan and Deci 2001; Morgan 2011; Manzo and Devine-Wright 2014). However, similar to how natural scientists encompass culture, nature is conceived in a relatively static way. It seems that humans extract not only resources, but meaning as well, from a 'faceless' environment, in which the function and identity specific species of plants and animals is ignored or remain obscure as part of the landscape or natural environment (e.g., Pitkänen *et al.* 2011).

Nonetheless, other disciplines, such as ethnoecology, and ethnobiology or disciplinary fields like more-than-human geography and human-animal studies, search for more specific connections between people and local biodiversity (Volpato et al. 2008; Sarmiento 2010; Head and Gibson 2012). These connections consider relationships between people and specific components of local biodiversity, including species of plants (ethnobotany) and animals (ethnozoology) and ecological systems (ethnoecology). These explorations integrate a vast array of cultural manifestations (e.g., people's identity, worldview, ritual, medicine, art, weather forecasting and everyday life) into a web of biocultural connections (Maffi 2005; Toledo and Barrera-Bassols 2008). In most cases, ethno-ecologists focus on the way human cultures have co-evolved with local biodiversity over the long term. As a result, their approaches have not addressed situations where people have short-term or new experiences with local biodiversity (e.g., immigrants or travelers) or have their "roots" with nature in several places and ecosystems. Human geographers and human-animal researchers, conversely, have advanced some theoretical and methodological work integrating scenarios of social novelty and human mobility, but again mostly centered at the human scale or their practices without necessarily the same emphasis on the particular characteristics of members of biodiversity (e.g., habitat, behaviour, migration) comprising the natural environment (e.g., Elder et al. 1998; Jerolmack 2009). Other notable examples include innovative research on human-animal relationships using theoretical

frameworks that are quite distinct from the mainstream practice of biological conservation and environmental education (Lorimer 2010; Vannini 2015).

In synthesis, while natural scientists tend to perceive human societies as static units, most social scientists do the same with biodiversity. However, the problem is not entirely disciplinary: it is also a product of the fact that (a) human-nature relationships become increasingly problematic in the context of accelerated human mobility, which is reshaping societies and their values; and (b) rapid ecosystem change is forming novel assemblages of new and local species. Consequently, we must challenge extant categories of nature and culture, taking more empirical and qualitative approaches that recognize the multinatural character of the Anthropocene (Lorimer 2012) .

3.2.1 Birds and people in the Anthropocene

Given the current scenario of social and ecological change, this innovative case study conceives the relationship between immigrants and birds as representing the interaction between human mobility and biodiversity. In this way, this research emphasizes the connection between concrete, verifiable and well-known components of biodiversity (birds) and people (immigrants) who are arguably experiencing the Anthropocene most symbolized by a drastic change in their social-ecological settings (i.e., place). The aim therefore is to test whether biodiversity, in this case represented by birds, plays social functions for immigrants in their new places. As natural scientists identify "ecological functions" of birds in ecosystems such as pollination and seed dispersion (Gardener et al. 2010), this work present and analogy to the social functions of birds for people. In this regard, sense-of-place is used as a lens or instrument to frame our study, given recent theoretical advancements that consider it in relation to human mobility and ecological change (Gustafson 2001; Kowarik 2011; Fresque-Baxter and Armitage 2012; Manzo and Devine-Wright 2014). In this sense, bird-human relationships microcosm represent socio-ecological units of study that are nested in novel socio-ecosystems (Chapter 2).

Sense-of-place is a beneficial human faculty that can be described as the way we feel 'linked' to the world we live in (Tuan 1977; Relph 1997). This faculty is complex and multi-dimensional, as it comprises physical, emotional, psychological, and social attachments with a geographical location. More specifically, humans develop cognitive-behavioural connections with these locations (Proshansky 1983), and built features of place—attachments that are also felt by others in our in situ social networks (Gieryn 2000; Hidalgo and Hernández 2001; Kyle et al. 2005; Scannell and Gifford

2010; Manzo and Devine-Wright 2014). In short, sense-of-place weaves together self, physical environment and social bonds in identifiable places (Stedman, 2003).

Until very recently, sense-of-place was understood to be in tension with human mobility, with immigration seen as a detriment to people's ability to cultivate and maintain a sense-of-place (Hernández et al. 2007). However, social scientists have now shown that people may feel attached to several locations by *in* and *ex-situ* social networks. Sense-of-place is thus understood to be dynamic, with people having multiple "roots-and-routes" around the world (Gustafson 2001). Accordingly, scholars began to examine whether changes in the natural environment (specifically climate change) might affect people´s connection with places (Fresque-Baxter and Armitage 2012; Manzo and Devine-Wright 2014). This dynamism now makes sense-of-place an ideal tool to understand the socio-cultural aspect of the human-nature relationship in the context of the Anthropocene (Chapter 2).

Birds are fitting representatives of Anthropocene biodiversity, not least because among members of the animal kingdom, they represent a broader set of socio-ecological landscapes. First, they inhabit a wide variety of places, ranging from the wildest areas to the most populated cities. Furthermore, because of their ability to fly, some birds seasonally migrate long distances, thereby uniting continents and biomes, and connecting wild ecosystems to urban areas. Since time immemorial, birds have been part of human material and symbolic cultures (Tidemann and Gosler 2010). Second, birds are likely to represent a full range of complex socio-ecological interactions. For example, while some species may represent extremely utilitarian relationships, like battery hens, others are taken up as heraldic animals or national symbols, such as the Andean condor (*Vultur gryphus*) in nations along the Andes. Finally, in between these extremes, birds include everything from poorly-known endangered and even extinct species (e.g., the Eskimo Curlew (*Numenius borealis*) to cosmopolitan urban dwellers that are often ignored (e.g., House Sparrow (*Passer domesticus*) and Rock Pigeon (*Columba livia*)).

From the perspective of human-animal interaction, what little we know about the role birds play in the sense-of-place of immigrants is intriguing. For example, when European immigrants settled around the world in the early 19th century, they introduced species from Europe as a way to keep ties with home. With time, local species also came to provide that foundation, becoming strong symbols of identity during the creation of new nation-states (e.g., the Bald Eagle, *Haliaeetus leucocephalus*, for the U.S.A.). In the 20th century, many of the once loved, European species either went extinct or became known as "pests" in their new settings (e.g., the European Starling, *Sturnus vulgaris*, in North

America), with the focus for conservation efforts and national pride shifting to local "native species" (e.g., Aslin & Bennett, 2000). This turn in social values towards nature has not been fully considered in light of increasingly and more complex patterns of immigration in the 21st century (see Vertovec 2007).

The context of the research is situated in Americas, where it is explored the meaning of birds in the life of recent Latin-American immigrants settling in the U.S. and Canada. Following the framework of "roots-and-routes" of Gustafson (2011), this research examined narratives of recent immigrants settling in a new place, and identified the circumstances in which people felt that species of birds represent "*roots*" to home and *"routes"* to new places. Using the conceptual lens of roots-and-routes, the purpose of this work, more specifically, is to better understand the relevance of birds to people's sense-of-place in the context of the increased human mobility, documenting species, meanings, experiences and feelings that lead to immigrants' perceptions of and attitudes towards birds and nature. By the end of the paper, the concept of "becoming" (*sensu* Deleuze and Guattari 2004) is discussed as a possible way to better understand human-bird relationship in the context of the Anthropocene.

3.3 Methods

3.3.1 Research design, participant profile and recruiting process

The design of this research was created to explore multiple connections between people and birds during the process of settling a new place, with birds being conceptually both (1) proxies of biodiversity and (2) indicators of adaptation to the new place. Human mobility embraces people adapting not only to a new society, culture, and language, but also to a new natural environment. Birds can portray different aspects of the adaptation, including changes in perception of natural phenomena such as climate, habitat, seasonality and biodiversity, but also social and cultural aspects of adaptation (new social networks). These associations between bird species and both biological and cultural phenomena constitute, in the context of this research, meanings, and these bird meanings represented social-ecological units of study. A qualitative was approach was used to document participants' meaningful species and their meaning from their first-hand experiences in their places of routes and routes. Birds and their meanings were triangulated and verified with ornithological and geographical secondary data, including research on the bird species mentioned and socio-cultural information about places named by the participants (Creswell 2007; Davies 2008).

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Between 2012 and 2014, using ethnographic interviews, I interviewed 26 Latin-Americans who have recently settled in Canada and the United States (1-6 years of residency). After obtaining ethics clearance (University of Waterloo ORE # 19166), participants who were interested in birds before they emigrated (e.g., birdwatchers, ornithologists, environmental educators) were recruited to increase the reliability of participant's bird species reports. With the sole exception of time of residence (> 1 year), we did not restrict participants by social factors such as age, gender or income. To maximize the diversity of participants, several recruiting methods were used, including announcements on birding-related internet social networks, direct contact with participants in the field (e.g., at birding sites), professional social networks, and snowball sampling. Most participants were contacted either by professional networks or snowball sampling, as in related quantitative and qualitative socio-ecological studies (e.g., Bang *et al.* 2007; Buizer *et al.* 2012; Vanwindekens *et al.* 2013).

Our participants (n=26: 12 women and 14 men) were originally from Latin American countries, with the exception of one participant born in Europe and raised in South America. Their knowledge about birds was variable, and they ranged from being amateur birdwatchers to ornithologists by training. Although participants had different backgrounds, they all were able to identify birds as part of functional groups (e.g., seedeaters and raptors), at some taxonomic level (e.g., family, genera, and species), and in relation to habitat. Reliability of bird taxonomic identification was re-enforced through reference to bird websites and bird guides during the interview and follow-ups. Interviews covered the entire life of participants, as far as they were able to remember, including moments in which they were not interested in birds or trained in their identification. This means that their experiences partly account for a broader public outside of specialist groups.

Interviews were conducted in Spanish by Skype, telephone, or in person, and they typically lasted 1-2 hrs. Interviews, if the participant agreed, were digitally recorded using a Zoom H1 audio recorder and/or compiled in handwritten notes. In most cases, interviews were followed with further short exchanges over Skype or email. When possible, I conducted participant observation while birdwatching with participants in local urban parks. Being originally from Chile and settled in southern Ontario, Canada, I traveled to Florida, USA and Colombia to expand his knowledge of bird species, as these two places represent hotspot of bird diversity relevant to many of the interview subjects (Kirksey and Helmreich 2010).

The interviews were broad, conversational and with open-ended questions about participants experiences with birds (Creswell 2007). The study took a longitudinal approach, beginning the

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interview from participants' childhood bird experiences and addressing, from there, the entire lifespan of the participants. This approach extensively explored their lives, inquiring about personal, social, cultural and environmental factors that they considered relevant for their relationship with birds (van Manen 1997). Using the concept of roots-and-routes as prompt, I asked participants to narrate their experiences in different places from their childhood to the present day, stimulating them to recall significant species of birds along the way. Participants described experiences, feelings and circumstances that surrounded their encounters with birds, as I asked for more details about locations, social and ecological factors. During follow-up sessions, the correct identification of species was verified with participants, as well attributed bird meanings, details about locations, and informative passages and stories were revisited.

3.3.2 Data processing and analysis

Interview audio-recordings were transcribed using Inscribe software (Inquirium, 2013), and anonymized by assigning random names to participants. Place, bird names and their meanings were collected from the transcripts. Data was organized in mind-maps having multiple branches and nodes (Freemind 1.0.1, 2014; Wheeldon and Faubert 2009). Given the multiplicity of places, regions, and of course bird species, we created one mind-map with three branches to compared birds and their meanings in participant roots-and-routes (Figure 3.1, A): one branch to store birds from the roots in Latin America and one for birds in the routes in North America. The third branch collected species that participants specifically recognized in both roots-and-routes.

In each branch, hierarchical nodes (Figure 3.1, B, C and D) were used to organize birds by country, region (province or state), city and/or location. For each species mentioned at the end of each node, we also registered participants' associations, such as "memory from childhood", "cultural symbol", and "place's soundscape". When the association was unclear, we noted the circumstances around the experiences, such as "while working", "family camping trip" or "walking on a trail in the new place." I called these associations "meanings" and stored them in the attributes of bird name nodes (Figure 3. 1, E). When more than one interviewee identified the same species at the same location, we separately entered each participant's nickname and meaning, using another attribute field in the same node. After completing the mind-map, we drew graphical hyperlinks between instances of the same species in separate locations (e.g., Figure 3.1. F). Using this aid, all *keystone species* (roots) and *key species* (routes) that were at least mentioned by more than one person were visualized and identified. Beyond its ecological meaning, the concept of keystone species in this work connotes the meaning of

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"foundation" or "root" similar to the concept of biocultural keystone proposed by Ibarra et al. 2012. Key species, on the other hand, connotes in turn the meaning of "unlocking" or "opening" (i.e., the gateways to new places). Secondary biological and ecological data about those species was also gathered to identify bird distributional ranges and habitats. In the text, bird common names (English or Spanish) are followed by their scientific names when first mentioned. Latin scientific names are important for Latin American ornithologist readers.
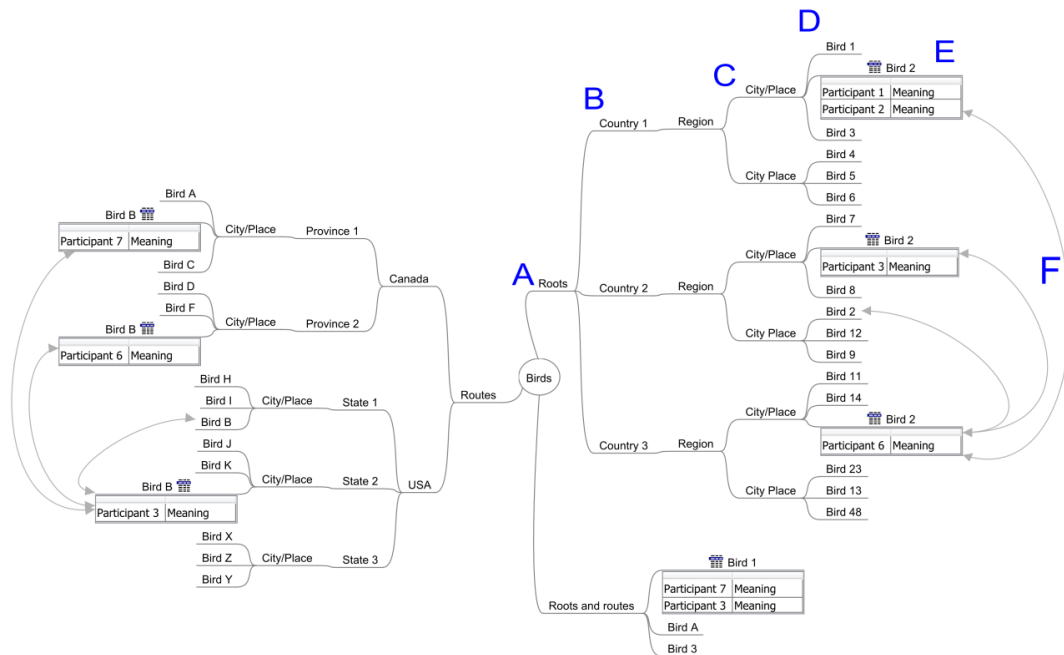
Figure 3.1 Design of Mind map (Freemind 1.0) organizing birds and their meaning reported by participants. Birds reported were located in three separate branches (A) (roots, routes and roots-and-routes) and hierarchically organized in nodes by locations (B, C, D). Participants and meanings were stored in attributes (E) of nodes containing bird names. Graphical hyperlinks (F) were used to visualize connections of species being reported in several locations

This study compared and contrasted participants' bird testimonies with biological information (e.g., Dunn and Alderfer 2006), ecological data, and ethno-ornithological sources (Vargas-Clavijo and Costa Neto 2008; Rozzi 2010; Tidemann and Gosler 2010; Ibarra et al. 2012) to make and support further inference about bird-participant relationships. At this point, it is important to note that linking species were identified by participants (when evoking connections between original and new places),

in contradistinction to those species that were identified as having overlapping appearance in the data using graphic mind map hyperlinks (Table 3.1).

Birds meanings from the transcripts were collected, coded, and organized in comprehensive themes or code groups, and listed them in order of recurrence or prominence in each category (Table 3.2 and 3.3). These code groups reflected generalizations about ways that participants connected birds with places, including which bird species and traits were significant for them. Later in the analysis, these associations were called "becomings" to reflect the indissoluble connection between the sensorial experience and the symbolic meanings that characterize human sense-of-place (Deleuze and Guattari 2004). This concept is revisited later in the discussion. In this approach, analyzed code groups represent manifestations of different becomings and the integration of more complex processes by which birds may aid people's adaptation to their new places. I illustrated and supported these more complex findings with translated quotations from the interview transcripts, which we connected to the theory via the use of diagrams (Creswell 2007; Manzo and Devine-Wright 2014).

3.4 Results

Taken as a whole, participants' life histories represent a wide geographical range of socio-ecological situations within the Americas (Figure 3.2; Table 3.1). From Chile to Puerto Rico, participants mentioned nine countries, 57 cities, towns and locales situated in several bioregions and ecoregions (*sensu* Dinerstein et al. 1995). These regions included the Caribbean bioregion (e.g., Puerto Rican moist and dry forests), Ecuadorian and Colombian portions of Amazonia, the Northern Andes (e.g., Santa Marta montane forest), the Central Andes (e.g., Bolivian Yungas) and several ecoregions in Southern South America, from the Atacama Desert to the Sub-Antarctic temperate forest (Figure 3.2). Natural, rural and urban locations were equally mentioned, including some of the largest cities in the region such as Lima (8.4 M, Peru), Santiago de Chile (6.3 M, Chile), Medellin (2.1 M., Colombia), Quito (1.6 M, Ecuador) and La Paz (0.8 M, Bolivia) (UND data 2005).

Participants' routes in North America were also diverse. Although the places they have resided in North America make for only 1/3 as many routes as there were roots, their routes included four Canadian provinces and six states in the U.S.A., including the ecoregions of Eastern Temperate and Tropical Wet Forest, Mediterranean California Chaparral and Woodlands, Marine West Coast Forest, and the Great Plains (CEC 1997). Participants' social contexts in their routes were more homogenous than in their roots, as they mostly settled in medium-size cities (population ~0.5 M or less) and mostly

mentioned semi-urban or urban places. There were a few exceptions to this trend, including remote locations such as Yellowstone National Park in the US and *Gwaii Haanas* National Park on the west coast of Canada.
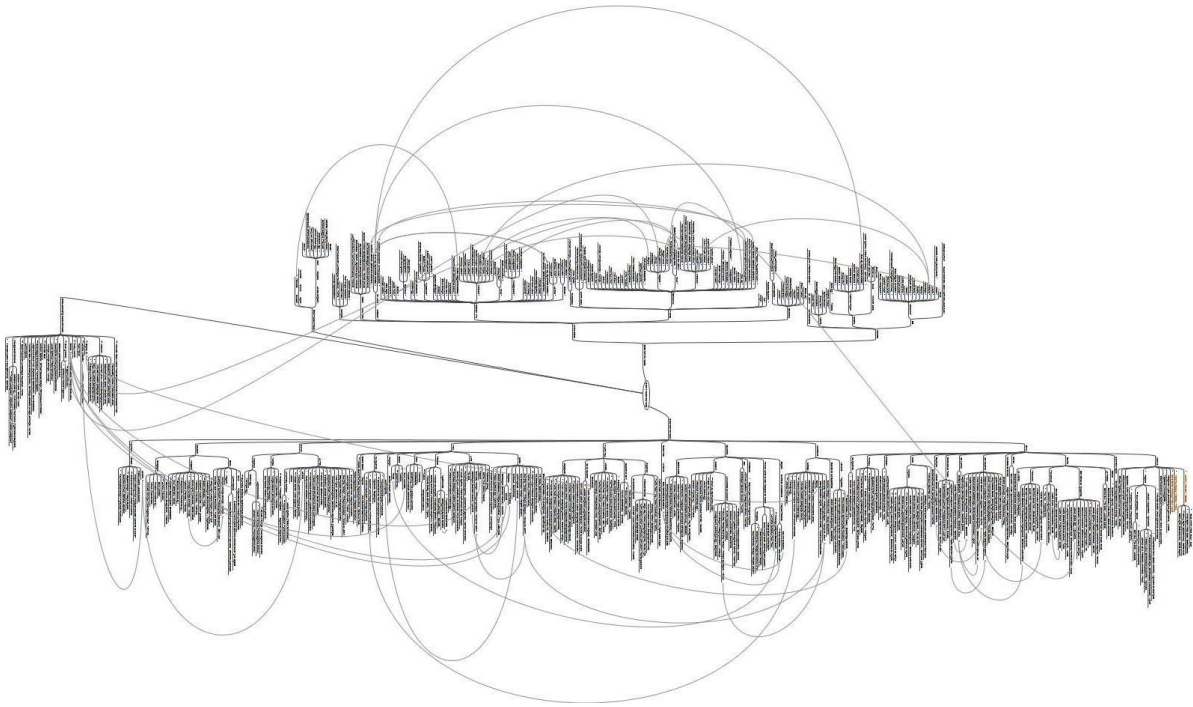
Figure 3.2 Freemind mind-map showing birds and places from roots (lower branch), routes (upper branch) and birds connecting roots-and-routes (left small branch). Labels were intentionally left illegible to show the reader the magnitude of the difference between birds and places from roots-and-routes. Hyperlinks show species connecting places. We can appreciate how species in the routes show more connections than in roots, relative to the number of species. The small branch (back arrow) shows places and species from Europe named by two participants

Despite individual differences, most participants were able to recall birds in most of the places they remembered living. The level of taxonomic identification and detail varied both between participants and within participants' recollection, according to their life stages and locations. This meant that some birds were broadly reported as general taxonomic groups such as herons (Ardeidae) and gulls (Laridae), or functional groups such as raptors or shorebirds. However, most participants named birds at the level of species, including *a posteriori* identification using their current knowledge, meaning that some participants were able to call up and identify birds from their own memories. A remarkable

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difference was found in the number of taxa reported in roots-and-routes, with twice as many bird species mentioned in the former (146) than the latter (72) (Figure 3.2). However, considering the total number of mentions of bird encounters per participant across all interviews, I found a less pronounced difference between roots-and-routes, with 339 and 306 mentions, respectively. This means that some participants were just as able to mention birds from their routes, despite the more narrow repertory of species known in Canada and the US.

3.4.1 Birds from both roots-and-routes

Participants recalled primarily terrestrial birds, shorebirds and wetland species. They named only five seabirds, including Black-browed Albatross (*Thalassarche melanophris*), banded penguins (Spheniscus spp.), and Atlantic Puffins (*Fratercula arctica*). Birds from the roots were mostly resident species, while migratory (both short and long-distance) species were more prominent in participants' routes. Besides local species, participants also named various human-introduced species, such as European House Sparrow (*Passer domesticus*), Feral Pigeon (*Columbia livia*), and European starlings (*Sturnus vulgaris*), in both roots-and-routes.

The vast majority of birds mentioned were wild species, although domesticated fowl, such as Domestic Geese (*Anser anser*), and several breeds of chickens (*Gallus gallus*) and ducks (Anatidae), were prevalent in memories of childhood. Caged birds and pets are included in this category, as well as a few songbirds and several species of wild domesticated psittacids (parrots, macaws, amazons and cockatoos). Interestingly, four mythological birds appeared in participants' narratives such as the human witch-bird *Tue-tue* (rural South-central Chile), the grandmother barn owl *Sirra* (Chilean Sub-Antarctic temperate forest, see Rozzi 2010), the bad omen *Allaimama* (Peruvian rainforest), and the mighty bird that gave origin to all hummingbirds (Ecuador). These three categories—domestic, pet and mythical birds—accounted for participants' deepest childhood memories, representing strong cultural heritage from bird traditional knowledge in Latin America (Villagran 1999, Ibarra *et al.* 2012).

Wild birds from the roots comprised a vast and diverse assemblage of 146 birds belonging to 61 families. Psittacidae, Emberizidae, Thraupidae and Tyrannidae were the most representative families. Resident (54%), partially migratory (19%) were more often mentioned than fully migratory birds. In terms of habitat, birds from roots represented an assortment of 13 wild, rural and highly urbanized environments, including generalists and widely distributed birds. The most commonly mentioned generalists were the Great Kiskadee (*Pitangus sulphuratus*), the Blue-gray Tanager (*Thraupis*

episcopus), the Rufous-collared Sparrow (*Zonotrichia capensis*) and the Vermilion Flycatcher (*Pyrocephalus rubinus*).

Participants mostly mentioned birds from their roots by their common names, which exhibit local variation. These keystone species (Table 3.1) were significant for people living in different locations and contained several cultural meanings through their names (Ibarra et al. 2012). For example, the Blue-gray Tanager had different names in Colombia (*Azulejo*, referencing the blue colour of a form of Spanish and Portuguese painted tin-glazed ceramic tilework), Venezuela (*azulejo de jardín*) and Peru (*violinista*, meaning violinist, reflecting the melodic and high-pitched song of the bird). Similar variation was found in the case of the Great Kiskadee, called *bichofue* in Colombia and *pipile* or Victor Diaz in Peru, each—including the English version—representing onomatopoeia[1] of the bird's song. The rufous-collared sparrow was mentioned by Chileans, Peruvians, Bolivians and Colombians, and its names derived from different indigenous languages, such as Quechua (*piquitanga*) and Mapudungun (*chinkol*) (Rozzi 2010).

In Canada and the U.S., participants identified and interacted with a smaller pool of 72 species belonging to 33 families. Paruliade, Accipritidae, Corvidae, and Strigidae were the most representatives. At first, participants recognized birds by large taxonomic or functional groups (e.g., woodpeckers, warblers, sparrows and raptors), with recognition of individual species being a secondary process that came after a verbal description. They celebrated the abundance and close proximity of large species of raptors (e.g., hawks, eagles and owls) and large-legged birds (e.g., herons, storks and cranes), as well as the arrival each spring of Neotropical migratory species. Participants were amazed by species that met each of these three characteristics (abundant, large and migratory) such as the Sandhill crane (*Grus canadensis*) and Tundra swan (*Cygnus columbianus*). A significant number of participants identified a same key species, including habitat generalists, such as Northern cardinal (*Cardinalis cardinalis*) and Blue Jay (*Cyanocitta cristata*), though they attributed different meanings to those birds (Table 3.1).

3.4.2 Recalibrating sense-of-place with birds

All but four of the respondents identified at least one species from their routes that evoked birds from their roots. Thirty of these linking species collectively compose an assemblage of cosmopolitan

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[1] An onomatopoeia as a "word or process of forming words whose phonetic form is perceived as imitating a sound, or sound associated with something, that they denote" (Mathews, 2014). You can hear recordings of these species at http://neotropical.birds.cornell.edu.

species and Neotropical migrants (Table 3.1). In some cases, linking birds were the same species in roots-and-routes (**accompanying species**), whereas in others they were new species that resembled species from their roots in terms of morphology (**taxonomic equivalents**) or behaviour (**ecological equivalents**).
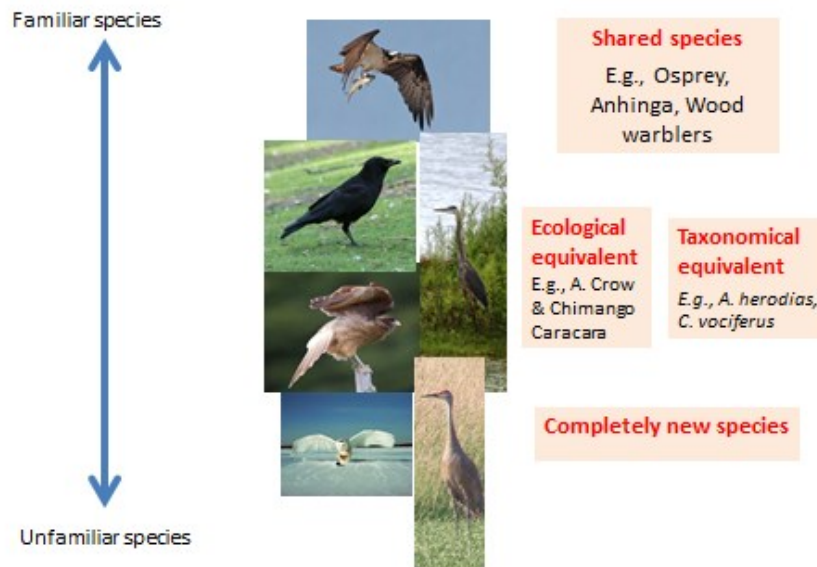
Figure 3.3 Participant named species that varied in terms of familiarity between roots-and-routes. This variation went from the recognition of same shared species to completely new birds in their routes. In the middle, participants associated species by their physical similarity (taxonomic equivalents) and behaviour and habitat (ecological equivalents). Public domain.

Several participants of the same nationality mentioned some accompanying species, such as the Anhinga (*Anhinga anhinga*, Ecuador) and the Great Horned Owl (*Bubo virginianus*, Chile). Other birds were recognized by people from different countries, such as the Osprey (Venezuela and Chile), and the American Redstart (*Setophaga ruticilla*) and the American Yellow warbler (*Setophaga petechial)* both in Venezuela and Puerto Rico. The cosmopolitan House Sparrow and Feral Pigeon also fit into this category for people from large urban areas in Colombia, Peru and Bolivia. Significantly, warblers (*es. reinitas*) were firstly identified as a group, and then individualized as species, being especially loved by Puerto Ricans.

Linking birds were classified as taxonomic equivalents when they were species of the same genus of previously known species from participants' roots. The most emblematic case was the American

Robin (*Turdus migratorius*), which resembles the Chiguanco Thrush (*Turdus chiguanco*) for Peruvians and the Austral Thrush (*Turdus falklandii*) for Chileans. Specifically, American Robins were "reddish Austral trushes (*zorzales colorados*)" for Chilean participants Fritz and Roseana. Similarly, Northern Mockingbirds (*Mimus polyglottos*) evoked their South American congeners, *Mimus thenca* (Chile) and *M. dorsalis* (Bolivia). In some cases, participants confused similar looking species, such as the Red-tailed (*Buteo jamaicensis*) with Rufous-tailed hawk (*Buteo albigula*).

In contrast, ecological equivalents were species with similar behaviour or ecological functions (e.g., seedeaters and raptors), regardless of taxonomy. The most obvious cases were North American tree-cavity excavators (e.g., woodpeckers, flickers, and nuthatches) that behave similarly to South American species (e.g., woodcreepers). In other cases, participants associated completely unrelated species, such as the American Crow and the Chimango Caracara (*Milvago chimango)* in Chile. Both species are "smart" gregarious scavengers that live in intimate relationship with humans (Marzluff and Angell 2005). Moreover, both species roost in large numbers during the winter in the tops of tall trees in urban parks and plazas. This bird-habitat-habits association was a powerful connection for participants' roots-and-routes.

In some instances, the distinction between taxonomic and ecological equivalency was less pronounced and some species may fit in any of the above three categories. For example, participants recognized herons and shorebirds in a collective manner, connecting a combination of bird features, behaviour and habitat. In these cases, participants do not individualize these as linking species even though some egrets and shorebird species are accompanying birds. Whereas the Great Egret (*Ardea alba*) and Snowy Egret (*Egretta thula*), for example, were not individualized as linking species, egrets as a group were recurrently mentioned as a familiar components of the landscape, evoking wetlands, rivers and waterbodies from home.

A linking bird that deserves special mention is the Northern Cardinal. Cardinals were new for all participants, however they were immediately associated with other red and conspicuous birds from roots, which also inhabit cities and semi-urban locations. In this way, participants aesthetically associated Northern cardinals (members of family Cardinalidae) with completely unrelated species, including the Vermilion flycatcher (Tyrannidae, Colombia) and Crimson-backed tanager (*Ramphocelus dimidiatus*, Thraupidae, Colombia). These participants, then, drew a connection based on neither taxonomic nor ecological bird features, but instead on the color red.

Table 3.1 Keystone, key and linking taxa for participants' roots-and-routes. Taxa are listed in descending order of mentions number of countries (roots: range 2-4) , number of Canadian provinces and U.S. States (routes: range 2-5), and number of participants (linking taxa: range 1-4).

Roots - Keystone taxa/species	Routes - Key taxa/species	Linking taxa/species
Hawks (*Buteos* spp.)	Northern Cardinal	American Robin$_T$
Herons (Ardeidae)	Black-capped Chickadee $_+$	Herons (Ardeidae) $_{STE}$
Hummingbirds (Trochildae)	Blue Jay	Osprey$_S$
Owls (Strigiformes)	American Robin	Barred Owl$_E$
Blue-gray tanager	Owls (Strigiformes)	Wood warblers$_S$
Roufus-collared Sparrow	Wood warblers (Parulidae)	Grey Horned Owl h
Shorebirds (Plovers and Sandpipers)	Bald Eagle	Owls (Strigiformes)$_{TE}$
Bananaquit (*Coereba flaveola*)	Osprey	Grackle (*Quiscalus* spp.)s$_T$
	American Crow (*Corvus brachyrhynchos*)$_+$	
Barn Owl	Snowy Owl (*Bubo scandiacus*)	House Sparrow$_I$
Guans and allies (Cracidae)	Sandhill Crane	Anhinga h
House Sparrow	Red-tailed Hawk	American Crow$_E$
Great Kiskadee	Red-winged Blackbird (*Agelaius phoeniceus*)	Woodpeckers$_{TE}$
Tapaculos (*Rhinocryptidae*)		Northen Flicker $_T$
American Kestrel (*Falco sparverius*)	Ducks (Anatidae)	Pileated Woodpecker$_{TE}$
American Redstart	Mallard (*Anas platyrhynchos*)$_+$	Prothonotary warbler
American Yellow Warbler	European Starlings (*Sturnus vulgaris*)	Blackburnian Warbler
Andean Condor (*Vultur gryphus*)	Great Blue Heron (*Ardea Herodias*)	American Yellow Warbler
Blue-black Tanager (*Tangara vassorii*)	Northern Flicker (*Colaptes auratus*)	American Redstart
Burrowing Owl (*Athene cunicularia*)	Barred Owl (*Strix varia*)	Cape may warbler (*Setophaga tigrina*)
Eared Dove (*Zenaida auriculata*)	House sparrow	Blackpoll warbler (*S. striata*)
		Black-crowned night heron (*Nycticorax nycticorax*)
Feral Pigeon	House Finch (*Haemorhous mexicanus*)	Rock Pigeon
Great egret	Brown Thrasher (*Toxostoma rufum*)	Turkey Vulture (*Cathartes aura*)
Oropendolas (*Psarocolius spp.*)	Raptors (hawks, eagles and owls)	Hawks (*Buteo* spp.) $_T$
Osprey	Hawks (*Buteo* spp.)	Red-Tailed Hawk
Scarlet Macaw (*Ara macao*)	Red-shouldered Hawk (*Buteo lineatus*)	Am. cot (*Fullica Americana*)
Swallows (Hirundinidae)	Cooper's Hawk (*Accipiter cooperii*)	
	Northern Mockingbird (*Mimus polyglottos*)	Black-capped chickadee
Vermilion flycatcher	Woodpeckers (Picidae)	Hummingbirds$_{TE}$
	Pileated Woodpeckers (*Dryocopus pileatus*)	Black-necked stilt (*Himantopus mexicanus*)
	Tufted Titmouse (*Baeolophus bicolor*)	Nuthatches (*Sitta* spp.)$_E$
	Black-and-white Warbler (*Mniotilta varia*)	
	Prothonotary Warbler (*Protonotaria citrea*)	American Kestrel
	Blackburnian Warbler (*Setophaga fusca*)	
	American Yellow Warbler	
	Eastern bluebird (*Sialia sialis*)	
	Herons (Ardeidae)	

S – Accompanying species; T – Taxonomical equivalents; E – Ecological Equivalent; and I – Introduced species

3.4.3 Birds' meanings and significance

Participants attribute a wide range of meanings to birds, whether regarding birds in themselves or their personal experiences with them. Accordingly, bird meanings were classified in two large thematic groups: meanings based on bird agency and those based on human experience (Table 3.2 and 3.3). Bird-agency theme comprised meanings related to birds' morphology, behaviour or habitat. Meanings in this category reflected the capacity of birds to be noticed and make themselves noticed by humans (see Bennett 2010). Meanings related to human experience, on the other hand, drew respondents' attention to situations in which birds represented memories from childhood or linkages to cultural traditions or heritage. Although they may overlap, these codes were differentiated to facilitate discussion.

Bird-agency meanings accounted not only for attributes, but also for circumstances, places or habitats in which bird-human interactions occurred. Overall, birds were memorable for participants when they, for example, see them distinctively "performing" like "wood-peckers" or "fly-catchers." Birds were also notable when they distinctively "look" like species that taxonomically are classified as woodpeckers or flycatchers. Again, a mix of previously known ecological roles and taxonomic equivalency provided a basis for comparison between participants' experiences with birds and places between roots-and-routes (Figure 3.4).

There were considerable differences between some bird-agency meanings of roots-and-routes. For instance, in their roots participants were collectively more inclined to associate birds with a large diversity of habitats. In their routes, conversely, participants focused on bird shape, behaviour or abundance, mostly in urban habitats were birds were prominent features of specific places or landscape (Table 3.2). Wetlands were an exception to the pattern of associating birds by their shape or behaviour, as participants commonly mentioned herons in wetlands and used them as references in their roots.

Interestingly, some birds in respondents' routes were strongly associated with seasonality. There was intriguing to note that participants were inclined to name birds in plural or as a group in association with seasons; for instance, warblers and cranes were specifically associated with spring, when they migrate, and owls with winter, when they start their reproductive cycle. With the exception of hawks, participants individualize species (e.g., the Northern Mockingbird) in association with their behaviours, aesthetic qualities (e.g., large size or colourful plumage) or attributes of their populations, such as abundance or rarity.

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Table 3.2 List of codes for bird meanings attributed by participants related to bird agency in roots-and-routes. Codes were comprehensively organized in code groups and listed in order of prominence

Code Group	Roots	Routes
Habitat	Temperate forest	Urban
	Altiplano (Andean Plateau)	Wetland
	Wetlands	Lakes
	Urban	Grasslands
	Semi-urban	Plains
	Amazonia	High Mountain
	High Andes	Beach
	Rainforest	
	Mountain cloud forest	
	Caribbean coast	
	Arid pacific coast	
	Pine plantation	
Features of the landscape	Soundscape/Vocalization	Everyday
	Colourful/Aesthetics	Spectacular
	Nesting	Aesthetics
	Abundant	Soundscape
	Everywhere	Behaviour
	Adaptation	Nesting
	Social behaviour	Abundance
	Ecological functioning	Red
	Large	Common
		Interaction
		Conspicuous
		Everywhere
		Blue
Classification	Endemic	New species
	Domestic	Invasive/Native
	Invasive/Native	Endemic
Connection	Other species	Roots
	Habitats	Routes
Seasons & Cycles		Seasons
		Spring
		Daily cycles
		Residents
		Migration
		Winter

Table 3.3 List of codes for bird meanings attributed to human experience in roots-and-routes. Codes were comprehensively organized in code groups and listed in order of prominence.

Code Group	Roots	Routes
Trajectory	Work	Challenge
	Challenge	Work
	Knowledge	Knowledge
	Study	
	Commitment	
Identity	Place	Local symbol
	Childhood memory	Place
	Cultural identity	Home
	Regional identity	Feeder
	Country	
	Home	
Experience	Everyday	First bird
	Close encounters	Discovery
	Exploration & discovery	Close encounters
	First bird	Mix feelings
	Interaction	Too different
Social interactions	Family	Family
	Friends	Friends
	Co-workers	Co-workers
Practices	Birding	Birding
	Pet	
	Trapping	
	Falconry	

Turning to human-experience meanings, participants tied birds to their intimate life, as symbols of their memories and identity. Birds were not uniquely meaningful by their own agency, but also by acting as "conduits" of emotions and experiences. Consider birds of cultural importance, such as national birds (e.g., the Scarlet macaw, *Ara macao* – Venezuela). In some cases, birds represented a complex multi-national belonging, such as the Andean Condor (*Vultur gryphus*) for nations along the Andes. Interestingly, participants recognized birds as symbols in their new places as well, including "official" provincial or state bird symbols (e.g., the Atlantic puffin in Newfoundland and Labrador, Canada) and in popular culture. Typical stained glass ornaments in homes in southern Ontario, for example, depict northern cardinals, blue jays and chickadees, and these objects are commonly found

in second-hand stores. These same birds are also symbols or mascots of popular sport teams and public schools, meaning that newcomers can easily recognize them.

3.4.4 Recalibrating roots-and-routes

Participants iteratively organize their experiences with birds (i.e., human experiences) and birds themselves (i.e., bird agency) in a complex range of familiarity (Fig. 3). Participants encountered unfamiliar and familiar birds and situations in their new places, provoking conflicted feelings. Some feelings evoked memories from previous experiences, whereas others provoked new and even *sui generis* experiences. These connections with birds ─back to the past, anchored in the present, and forward to the future─ create a "sense" of place that is iteratively calibrated through time by socializing with peers. In other words, birds acted as **points of reference** in a process where the human recalibrates experience with birds, people and place generates varying degrees of emotional distance between roots-and-routes (Fig. 3). By fixating on basic morphological or behavioural patterns of birds, such as, for example, herons standing tall and still (and "elegant" as participant Roseana stated), participants recalibrate wetlands of Wisconsin with "similar" habitats of the Amazonia and Southern Chile.

   In the routes, birds were not only points of reference for participants recalibrating place in its physical dimension, they were also important in a process of identity recalibration. For instance, birds tied to professions, occupations or social activities were linked to participant self-realization (see Ryan and Deci 2001). This means that linking species such as warblers were tremendously significant to the continuity of participants' identity as, for example, birdwatchers or ornithologists (Fig. 5). Both place and identity recalibration work together in the same process, in which linking species mirrored both personal achievements and place physical dimensions (Tables 2 and 3).

   Socialization catalyzed the recalibration of participants' place and identity (Fig. 3). As mentioned earlier, birds were an important medium of socialization in the lives of all participants. In the new place, therefore, the possibility of sharing experiences with birds with other people was essential for both participant´s social life and sense-of-place. In Javier's words, for example, the wetlands of North Florida became more familiar when he shared his bird observations: "*and I said, YES! I know this bird, and I told somebody: we have that bird in Ecuador and it's found in Amazonia. It can be found, like here, in the swamps, but I never saw an Anhinga together with cormorants! There are a lot of cormorants in here. These casual conversations somehow transported me back to Ecuador. Perhaps after that, the landscape* [of Florida] *became more familiar to me*." This *sui generis* experience of

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anhingas together with cormorants prompted an emotional relocation of place (i.e., being "transported back"), creating a link of familiarity between Florida and Ecuador. Javier makes this realization conscious for himself when he verbally shares this experience with "somebody", reflecting the linkages between place recalibration and socialization. The participants widely shared a realization of the importance of peers and friends for the recalibration of bird experiences.
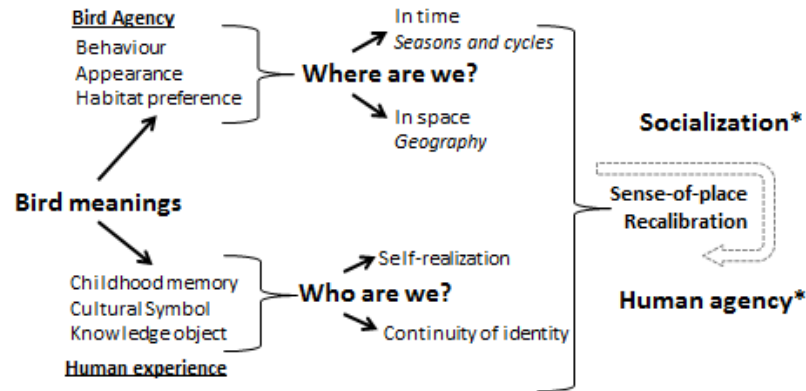
Figure 3.4 Process of Sense-of-place recalibration. Meanings of birds integrate their ecological (bird agency) and social functions (birds as symbols in the human experience). Both meanings attributed to bird agency and human experience form part of sense-of-place for Latin-American immigrants in Canada and the U.S. Therefore, birds socially function to foster people's imaginary relocation as points of reference in space and time (i.e., answering the question: where I am?), and giving continuity to identities and realizations of people between roots-and-routes. Finally, these bird-becomings relocate place familiarity and identity, helping people to recalibrate their sense-of-place, iteratively (see discussion for more details).

Although uncommon, there were also instances where recalibration did not occur, and there was a sense of disconnection between roots-and-routes. To some degree, all participants felt this disconnection initially. However, most of them overcame it with time and the achievement of new social connections around birds. Participants who failed to make this reconnection showed poor local knowledge of birds and a pessimistic attitude toward local avifauna. For example, participant Ezra expressed his frustration with Florida's avifauna: "*I had the opportunity to go birding to some lakes*

close by, but honestly, I felt frustrated and it made me miss Peru even more . I don't know, there, in the jungle, you are overwhelmed with so many things, sounds and colours, but here it is always the same, the same—just crows! Just crows! Birds don't have colours…I lost motivation, to the point that I didn't bring my binoculars the last time I came back [from Peru].*"* In contrast, participant Eura, who originated in the same country and who lived in the same city in Florida, participant Eura, conversely stated: "*I think that there are very beautiful birds [here], very beautiful. I did not see birds like these in Peru, nor in the countryside or in the city. Except for grackles, they are not the same species, because they have a different coloration, but the structure of the body is the same. Nevertheless, the other birds that I saw [here], I said: how rare they are! How rare and beautiful! […] I never saw crows before in my life.*"

   The participants revealed that the reconstruction of their social lives and identities around birds was as important as the birds themselves. Participant Marquis, for example, recalibrates his identity with birds by expanding his birding horizons and joining birding organizations: "*Here I realized that bird identification is harder that in Chile because you have birds such as sparrows, thrushes, and, of course, the warblers…so, I started to "get the deal" (es. agarrar la onda)[of birding], and it wasn't easy at the beginning, but I start to get involved, little by little, and join the Audubon Society, where I have helped to find birds and participated in field trips with them.*" These quotes from Marquis and Javier help to demonstrate the extent to which place recalibration is a dynamic process that involves social interactions and negotiation of identities.

3.5 Discussion

3.5.1 Bird socio-ecological functions: sense-of-place recalibration, becoming and conviviality.

Biodiversity sustains humankind; therefore, the more we understand how biodiversity functions, the more we recognize its role providing essential 'ecosystem services' such as clean water and air (Millennium Ecosystem Assessment 2005). Ecosystem services, for example, are an economic interpretation of the outcomes from complex biogeochemical processes where a web of species interact with abiotic components of ecosystems (Hooper et al. 2005). Therefore, when we conserve biodiversity we are not only ensuring the continuity of species, but also the sum of all their ecological functions (Balvanera et al. 2001). If, moreover, biodiversity provides 'cultural' ecosystem services, such as recreation, spirituality and identity, that also contributes to human social well-being

(Millennium Ecosystem Assessment 2005; Daniel et al. 2012; Winthrop 2014), it is crucial to rethink the mechanisms by which biodiversity 'functions' for human existence.

Birds 'function' embodying meanings that interweave places, bird agency and the human experience. By this triple attribute, birds can assist immigrants recalibrating their sense-of-place and identity. Such complexity can framed from a different perspective and say that participants also *become* the birds that they study, look for, and work with (*sensu* Deleuze and Guattari 2004). As we anticipated earlier, the connection between the main research finding (place recalibration) and the philosophical concept of *becoming* requires more explanation, as we find that these *bird becomings* have further (and practical) implications for both the study of human-nature relationships and the conservation of bird species in the Anthropocene.

Philosophers derive the meaning of "to becoming" from its archaic Greek form, to be in a process of constant change. In our reading of this process, people (in the case of this research) may obtain new properties from their participation in assemblages or collections of things (Deleuze and Guattari 2004). In the process of flight and moving, in and out, from one assemblage to another (i.e., place), there are a wide range of possible becomings as people and birds encounter each other. Deleuze and Guattari call the process of such moving "deterritorialization," suggesting that there is an overlap between assemblages or places and personal identity. This is consistent with our research framework of roots-and-routes, and the idea of a mobile place identity in recent sense-of-place literature (Gustafson 2001; Manzo and Devine-Wright 2014). We should not, however, confuse this process with displacement, which is coercive; instead, it refers to the recognition of the interconnectedness between the self and the environment like a "rhizome" that horizontally spreads "roots and shoots" with no single or fixed identity or territory (Deleuze and Guattari 2004). Bird becomings are therefore rhizomatic and boundless (Figure 3.2), facilitating the place-making process as a means to integrate biodiversity within personal identity. Although This research focuses on the role played by birds in the lives of immigrants, bird becomings were considered as units of study in larger and emerging patterns of relationships within shifting socio-ecological assemblages, where the relevance for human needs emerged from the coexistence with birds in their places (Lorimer 2010; Collins *et al.* 2011; Head and Gibson 2012). This philosophical standpoint can be useful addressing cultural ecosystem services that conversely conceive biodiversity-human relationships are unidirectional, and scientists have to first assume the utilitarian value of nature to demonstrate the usefulness of biodiversity for human needs (Millennium Ecosystem Assessment 2005; Daniel et al. 2012).

In addition to bird becomings, our identification of birds as a medium of social life reveals that human-biodiversity relationships are multidimensional and iterative. People make sense-of-place and birds when they share experiences with others. This realization implies that human-nature relationships are evidently social and enacted from a multidirectional flow of *conviviality* between people, birds and the environment. Geographers coined the term *conviviality* to conceptualize this form of "living together", in which people and wildlife establish a multiplicity of associations, especially in urban environments (Hinchliffe and Whatmore 2009). Certainly, becoming and conviviality are two concepts that require more exploration, although they already offer a wider perspective of human-nature relationships in the Anthropocene, bridging natural science, social science and humanities with concrete research outcomes (bird-becoming as a unit of study) and direct applications for conservation and environmental education.

3.5.2 Conservation in the Anthropocene: becoming the "birds of the forest interior"

The imaginary assemblage of 33 linking birds (Table 3.3) provided a foundation for peoples' place and identity making. These species therefore are potentially meaningful for many people, motivating social actions for conservation, for instance. However, most linking and key species have a "least concern" conservation status (*sensu* IUCN 2012), and consequently ornithologists and birdwatchers give them little attention. Some may also disregard this assemblage as an "immigrant mindset" of only common birds and generalist species (e.g., Clarke and Agyeman 2011). It contains few endangered species and habitat-specialists, such as the "birds of the forest interior" (e.g., Hooded warbler, Burke *et al.* 2011). Yet this finding may also reflect immigrants' lack of access to or conviviality with the "forest interior," as participants all have a great interest in birds. Thus, instead of discounting a priori the value of these species of "least concern", we should encourage their bird becomings as people who have demonstrated their capacity to transfer meanings to birds they have never seen before (e.g., Northern cardinal).

The challenge, then, is how to encourage people (and not only immigrants) to engage in becoming with the birds of the forest interior. Our participants strongly care about birds that are entwined in their own becoming; and, in general, the more attuned they feel in their routes, the more prone they are to participate in local bird conservation activities (see quote from Marquis, above). Participants who do not feel integrated in their social life and natural surroundings do not contribute to local conservation despite the wide expertise they have from their home countries. This finding can applied to 2-step conservation programs, wherein first we encourage conviviality of people with key species,

other people and local habitats; then, later, we provide people opportunities to make connections with endangered birds, for example, recalibrating the red of cardinals with the red of the Scarlet tanagers in North America. Accordingly, we need to craft participative conservation actions based on place (see Stewart *et al.* 2013) and conviviality, in which the socialization between long-term residents and newcomers in nature is horizontal and multidirectional, recognizing that we are *all* trying to make sense of the Anthropocene.

3.6 Final Remarks

Birds represent multiple connections between roots-and-routes for highly mobile people. Newcomers may encounter the exact same linking species (migratory, cosmopolitan and/or wide-ranging birds) or convey the equivalence of key species that evoke a sense-of-place (e.g., caracaras and crows). By their sounds and colours, linking and key species create familiarity (or a sense of unfamiliarity) that helps immigrants to re-calibrate their place experience and identity. By these connections, people weave the agency of birds with features of themselves (e.g., cultural identity and personal achievements), thus becoming more attune with the new place.

   Throughout the recalibration process, the socialization of bird experiences was critical to place and identity making. The participation of birds in this process can be thought as social functions of birds for immigrants in novel socio-ecosystems (Chapter 2). People do not merely use birds alone as points of reference to recalibrate their sense-of place; indeed, this recalibration rests upon social networks and interactions. As points of reference, keystone, key and linking bird species facilitate a more dynamic and convivial understanding of the non-human world, in which bird becomings are useful and truly social-ecological units of study. The outcomes of this research of human-bird relationships in the Anthropocene contribute to reorient bird conservation and environmental education initiatives.

Chapter 4

Bird by bird: Continuity between humans, birds and places in age of human mobility.

4.1 Abstract

Both physically and mentally, humans in the 21st century are more mobile than ever. However, our relationships with nature have been statically studied without including our personal dynamics in time and space. In this research human-nature relationships are conceived as an active and concrete process by investigating the dynamics (drivers, factors and processes) in the relationship between Latin American immigrants and birds in Canada and the US. Using in-depth ethnographic interviews, this study followed the progression of their relationship with birds through the life-stages of 26 Latin American immigrants who were previously interested in birds. Life stages included childhood, adolescence, early adulthood, mid-adulthood, and immigration's change-of-place. Most participants showed fluctuations in their relationship with birds, which varied in nature and meaningfulness. In association with other factors, childhood play, social organization and other drivers, combining socialization (family, friends, and peers) with human-agency (exploration, organization and play), produced the most meaningful relationship with birds. The absence of these drivers was associated with the lowest level of meaningfulness, especially during adolescence and at the beginning of change-of-place. The most intense bird relationships were found during mid-adulthood, in which birds were carriers of family, ethical and cultural values for participants as parents. Our research supports similar findings of childhood nature experiences explaining adult environmental advocacy. However, socialization and human-agency were paramount for bird relationships in all life-stages, especially when people experience a change of place. Accordingly, outcomes of this research are offered to social programs trying to reconcile human mobility and nature in the Anthropocene.

Keywords: human-bird relationships, immigration, sense-of-place, life-stages.

4.2 Introduction

The span, intensity and interconnectedness of environmental problems (e.g., accelerated climate change and biodiversity loss) are believed to be simultaneously the cause and effect of a problematic disconnect between humans and nature (Miller 2005; Gosling and Williams 2010). This disconnection creates a negative feedback loop, in which most people ignore the psychological benefits that biodiversity provides to human life. Consequently, people become unaware of the full extent of the negative impacts their actions and decisions have on biodiversity, themselves and the biosphere (Millennium Ecosystem Assessment 2005). Since the second-half of the 20th century, the accumulative effects of our negative actions have reached a global scale, altering the entire planetary system (e.g., climate change). This human-made global change forms part of a proposed new geological era called the Anthropocene, in which we, collectively, are the main driver of change (see Ellis *et al.* 2013; Lewis 2015).

   The ecological expressions of the Anthropocene are accompanied by equally accelerated social change (see Pizarro et al. in rev; Lewis 2015). One component of this social change is an increased human mobility, including transnational immigration by means of mass transportation, globalized markets and instant telecommunication systems (Cresswell 2011b). This increased mobility has contributed significantly to the feeling of novelty often expressed about the world, that is that 'things' are not the way that they used to be (Barbieri Masini 2011) and that societies are extraordinarily globalized, complex and multicultural (see Mac Laughlin 1998; Chryssochoou 2000; Vertovec 2007). Social novelty deals not only with changes in societal composition through migration, but also with the complexity of the coexisting and sometimes contested worldviews about nature with "roots-and-routes" around the world (see Gustafson 2001; Head 2007; Buijs *et al.* 2009; Chapter 3).

   In the study of human-nature relationships in the Anthropocene, social complexity by human mobility has been inadequately considered or reduced to problems of ethnic tension or conflict arising around migration (Coates 2007; Ray 2009). Proposing solutions, comparative studies seek to find differences between environmental attitudes and behaviours of immigrants and long-term residents (Hunter 2000; Buijs et al. 2009; Peters et al. 2010). Other studies, for instance, simply view immigration *a priori* as a detrimental environmental factor or conclude that immigrants have less environmental awareness than long-term resident (Pfeffer and Stycos 2002; Price and Feldmeyer 2011; Lovelock et al. 2011). Consequently, we have been less attentive to the development of concrete human-nonhuman relationships emerging between immigrants with biodiversity adapting to

a new place. Instead, scientists and philosophers continue to use abstract concepts, such as 'nature' or 'environment' to evaluate people's connection to the world (Mayer and Frantz 2004; Frantz et al. 2005; Vining et al. 2008; Gosling and Williams 2010), with no definitive explanation of factors and drivers that lead, for example, to pro-environmental behaviour (Kollmuss and Agyeman 2002). In the same way, intellectuals also produce ideas and metaphors (e.g., novel ecosystems, anthropogenic biomes, see Ellis and Ramankutty 2008) to advise policy makers and practitioners about how to confront concrete environmental challenges (e.g., restoration of ecosystems towards a natural state), in absence of knowing the full extent of their ecological and social implications (Larson 2009; Buijs 2009; Buijs et al. 2009; Decouvelaere 2011). Largely assumed universal metaphors of "nature' or "native biodiversity", for instance, are largely biased by specific cultural values, political standpoints and personal experiences (Hinchliffe 2007; Callicott 2008; Larson 2011b).

In the age of mobility, in sum, researchers have been trying to study humans and nature as they both were physically and conceptually fixed to specific locations (Gustafson 2001; Cresswell 2011a). This fixation is problematic because it implies that, on the one hand, immigrant-nature relationships relate with nature upon a permanent ethnicity, without the consideration of people's personal dynamics and history (Buijs et al. 2009). Nature, on the other, is conceptualized under specific worldviews (Hinchliffe 2007). In this way, humans-nature relationships have been thought more as a fixed outcome instead of an ongoing process. By thinking about human-nonhuman relationships as processes, we can hypothesize that persons have trajectories that are influenced by several social and ecological factors. These trajectories also mirror larger social and political shifts and events that influence people's attitudes toward nature (e.g, Aslin and Bennett 2000). These trajectory and events would occur across a person's lifetime including patterns of continuity and discontinuity between people, multiple places and their biodiversity.

This study offers birds as concrete representatives of the nature for people on the move. For immigrants, birds can represent the full range of socio-ecological dynamic because they are physically and symbolically present in all biomes, places and cultures in the world (Chapter 3). Examining human-nature in the Anthropocene, this research seeks to understand which factors associated with the personal history of place-life dynamics affect the way immigrants relate to birds in their new places. In other words, this work examine retrospectively examined the "ups and downs" of human-bird relationships in immigrants' past and present lived experience (*sensu* van Manen 1997). With the explicit purpose of addressing such dynamism, I examined relationships with birds

through the life-stages of immigrants, including the fluctuations of their relationships with birds before the moment of migrating to and settling in a new country. The research scenario is set in the Americas, studying the relationship between Latin American immigrants and birds in Canada and the United States, and exploring how these relationships developed from their previous experiences in their countries of origin. From the findings in each life-stage, models were created to explain how human-bird relationships are generated. Finally, I argue that the perceived lack of environmental connection of immigrants with place and nature can be a broader problem of social representation and inclusiveness.

4.2.1 Research assumptions

For both research design and data analysis, this research took a phenomenological approach (Ingold 2000; Schroeder 2007; Lorimer 2010; Angelo 2013) that strongly consider the lived experience of participants. To research lived experience is to inquire about the way participants have experienced the world in which they live, including their *Geist or Gestalt*—the complex sphere of thoughts, consciousness, values, feeling, emotions and actions (van Manen 1997; Schroeder 2007). Phenomenology provides the opportunity to understand phenomena as dynamic processes across people's life-stages and/or people-environment interactions (Creswell 2007); hence, it is commonly used in pedagogy and health sciences research (van Manen 1997), and also in environmental psychology when studying people's connectedness to nature and pro-environmental behaviour (Frantz et al. 2005; Schroeder 2007; Vining et al. 2008).

The qualitative approach of this research addresses the relevance of bird-human relationships for immigrants in their new place of settlement. Accordingly, human-bird relationships were conceived as processes, focusing on participants' place experiences with birds and tracking the development of such experiences during their life-span. In this way, this research seeks explanations for bird-place associations, avoiding *taxonomization*—that is, the tendency to classify lived experience in terms of extant categories of, for example, ethnicity or class (van Manen 1997). By using elements of environmental sociology and psychology (e.g., agency, self-realization), this research identified common patterns of meaningful relationship with birds within and across participants' life-stages. The research's aim is to better communicate and explain the whole process of human-bird-place relationship making, integrating participants' experiences with birds during childhood, adolescence, and adulthood. The effect of significant moves (change-of-place) was also considered as a formative influence that could overlay these separate life stages.

4.3 Methods

4.3.1 Participants and interviews

I selected 26 Latin Americans who settled in Canada and the US during the last six years. They were all previously interested in birds, and I recruited them using bird-related internet social networks (Facebook bird groups, email lists) and snow-ball sampling. Participants were contacted via email and were invited to participate. Interviews were conducted via telephone (1), skype (20) or in person (5). The interviews, which took place in sessions of 1 to 2 hrs, were in-depth, ethnographic and in conducted in Spanish. Interviews were ethnographic in the sense that they were in intensive, conducted in participants' mother language, and considered participant shared cultural background and immigrant status (Creswell 2007).

Before starting the session, the interviewer sought to set a conversational tone and provide a non-competitive and congenial atmosphere for participants. After introducing himself, the interviewer asked participants to openly tell him about themselves, who they are, where they were born, etc. Then they were asked to narrate their experiences with birds throughout their life. It was clarified also that interviews were not meant to test their knowledge about birds, because the research considers their experiences with birds in a broad sense. During the main part of the session, the interviewer prompted participants to recall important bird memories throughout their life, across the stages of childhood, adolescence and early and mid-adulthood, and also examined participants' immigration process (change-of-place) as a distinct life-stage.

Through prompts or short questions, the interviewer invited participants to evoke places, feelings and circumstances surrounding each bird encounter or event, including the presence (or absence) of relatives, friends or significant others; and to describe the physical features or settings of places where those events happened. In most cases, participants organically shared key social and environmental factors without assistance or prompting. However, participants did not necessarily narrate events in a chronological order. For this reason, follow-ups of shorter duration were set at the end of the session to revisit life-stages or events that could otherwise be insufficiently explored.

All interviews and follow-ups were digitally recorded, upon either written or verbal consent (University of Waterloo ORE# 19166). Interview materials were manually transcribed using Inscribe v.2.2. Real names were replaced in transcribed materials by gender-matched, random names from an online generator (http://random-name-generator.info) to maintain participant anonymity.

4.3.2 Analysis

A general qualitative data analysis strategy was followed to describe participants' bird experiences throughout their life stages. Also known as *spiral analysis* (Creswell 2007)*, this approach considers that the research phases of data collecting, analysis and writing are iterative and interactive, and are customized to serve the purpose of research. In this case, interview materials were analyzed using open coding, in which codes were later reduced to salient patterns or themes (RQDA v.0.2-7, Huan 2014). Although a preliminary or lean code was not used, it was considered the identification of environmental and social factors associated to bird-place connections through participants' life stages. Therefore, themes described either environmental and social factors or circumstances affecting human-bird relationships as processes.

Themes were contrasted across participants, built narratives to describe processes for each life-stage, and selected quotes from participants illustrating each situation. Quotes were extracted from interview text in Spanish and then were translated to English as directly as possible for both denotative and connotative meanings. For expressions and idioms that were hard to translate, I enclosed the original in parenthesis followed by the best possible English expression I can find consulting with other bilingual researchers, and corroborated quotations with participants. In the transcription of quotes, ellipses were situated in brackets to avoid any possible confusion with suspensive points.

Inferring from data and participants' explicit testimonies, a qualitative scale was created to interpret bird meaningfulness across life-stages. With this information, bird meaningfulness is defined as a qualitative scale measuring the relevance of birds in participants' lived experiences. A high level of meaningfulness (+) includes birds having full and diverse significance for people, resulting in relationships with birds that can be easily interpreted by the researchers. A low level of meaningfulness (0) implies that the significance of birds remains obscure, or occurs when participants reported no interest in birds or negative attitudes towards them. In all our analyses, bird taxonomy or biological identity remained broad and collective, like "voices in the forest" (Feld 2012), as the attention was centered on the human experiences instead of biogeographical links between the avifauna of participant's places. A complementary study addressed bird taxonomy in detail (Chapter 3).

4.4 Results

With respect to demographic features, participants formed a homogeneous sample (*sensu* Creswell 2007a) of 10 woman and 16 men, mostly in their young adulthood (~30 years) having similar socio-economic conditions (economic immigrants and international students) as graduate students and young professionals in Canada and the U.S. Considering their place of origin and life in Latin America, participants originated from eight countries, from Puerto Rico in the Caribe to Chile in the Southern Cone, and had diverse backgrounds, family histories, and rural and urban livelihoods.

Regarding their relationships with birds, participants described a diverse set of situations and experiences ranging from their early childhood through the present day. Altogether, these experiences and situations generated 124 codes. Instead of grouping codes in themes as topics or concepts (e.g., socialization, natural environment), four working themes were used to facilitate data organization, the description of processes and the identification of factors and drivers affecting participants' relationship with birds (Table 4.1). Each working theme comprised elements that helped us to define particularities of life-stages and bird meaningfulness. Among factors influencing bird relationships, a striking number of codes emerged in relation to socialization with peers, friends and family, as interactions with significant others were present during all life-stages. In contrast, physical components of the environment were not as significant as expected, though they served as anchors for recollection of places and situations where bird interactions occurred. Socially and environmentally salient issues with place and birds were woven in a continuous way through participants' life-stages. In the next sections, I present and describe models of human-bird interactions, mapping drivers and factors for the life-stages of childhood, adolescence, early and mid-adulthood

4.4.1 Childhood: A "land feeling" connection with place and birds

From Puerto Rico to Chile, participants lived in rural and urban settings during childhood. Independently of their place-of-birth, most participants agreed that their most intense feeling of place was associated with the place where they grew up. "*I was born in Viña del Mar,*" participant Lloyd commented, *"but I don't have an emotional relationship to Viña del Mar.*[…] *I don't have that 'land feeling' for Viña. I think that it's the city with the highest standards of living in Chile, but I have my emotional and land roots tied to Coyhaique where I grew up, I'm 'Coyhaiquino.'*" Lloyd's quote provides evidence that the process of growing up ties people to places in a stronger manner than mere attraction for place amenities. Consistent with the other participants' opinions, this finding suggests that childhood places are key places to begin searching for early connections with birds and nature.

Table 4.1 Working themes and codes for factors affecting bird meaningfulness in life-stages.

1- Lived experience - Life-stages	Self-realization	4- Bird relationship factors
Adaptation	Sense of Wonder	Access to books
Adolescence	Shared social interest	Binoculars
Back to the roots	Social life in the new place	Close to birds
Childhood	Social organization	Contradiction
Culture new place	Social relationships	Country
Early adulthood	Spirituality	Cultural diversity
Hybrid cultural identity	Stress	Culture
Immigration	Study	Economic factors
Mobility	Success	Education
New place	Technology use	Environment - seasons
Perception of time	Unsupervised play in nature	Family
Place roots	Values	Friends
2- Bird relationship drivers	Work	Gatekeepers
Alone in nature	**3- Bird meaningfulness**	Health issue
Bird Close encounters	Biodiversity	Heritage
Bird listing	Bird abundance	Hobbies
Bird practice trapping	Bird aesthetics and soundscape	Infrastructure
Bird practices - caging, pet, zoo	Bird behaviour	Innovation
Bird practices - falconry	Bird complexity	Institutions
Bird practices - feeder	Bird connection	Intergenerational change
Birding	Bird conspicuity	Internet social network
Birding - Latin America	Bird diversity	Language
Birding - North America	Bird exotic/invasive	Lifestyle
Birding skills	Bird experiences - place origin	Mass media
Challenge	Bird experiences - new place	Mentorship
Commitment	Bird identification	Neighbourhood
Communication	Bird in the everyday life	Orality - event
Comparing places	Bird knowledge	Other fauna
Competition	Bird meaningfulness	Perceived social change
Emotions	Bird migration	Place - dependence
Human agency	Bird new species - familiar	Place - risk perception
Human nature relationship	Bird new species - unfamiliar	Place - transportation
Identity	Bird physical contact	Place environment
Intense field experiences	Bird rare	Political issues
Outdoor activities	Bird Shared species	Power relationship
Personal growing	Bird species new place	Privilege - travel
Playfulness	Bird symbol	Research
Self-awareness	Birds species place of origin's	Rural - urban
Self-determination & interest	Cultural significance	Sense-of-place - Geography

Participants' strong relation between identity and childhood may lead to the hasty conclusion that a more naturalized or rural childhood would provide people with a stronger connection to nature than an urban place. However, childhood connections were far more dynamic and complex than expected. Indeed, they varied in significance almost entirely depending upon where the experiences with birds occurred rather than on where the participant lived or grew up. As such, participants living in urban areas reported similar experiences with the countryside as participants with complete rural childhoods (e.g., Javier's quotations below). Although more sporadic, the rural childhood experiences of urban participants (and the specific places where these experiences happened) were highly significant and stimulated their interest in nature and birds. These findings support the idea that physical place of residence by itself, although meaningful, does not entirely explain people-bird relationships.

All participants narrated some kind of experience connected to rural places during childhood when they recalled birds. Rural childhood experiences with birds and nature were broad, rich and non-normative (experiences separated by norms of good v/s bad). They integrated several other animals, plants and features of the landscape, and not only birds. For these reasons, in this section, some narratives that do not contain birds at all are reported because participants found them meaningful for their connectedness with nature in general, in association with interesting events and situations where birds were involved. Indeed, when birds appeared in these stories, they rarely were taxonomically identified. On the contrary, they were broadly recognized as birds in general terms (hawk, parakeet) yet highly individualized through a proper name and identity. These earliest memories were usually tied to domestic fowl or pet birds, and their stories commonly involve play, free roaming and exploration without close adult supervision. Therefore, rural childhood experiences included manipulation and experimentation with the non-human world without moral restrictions. During unsupervised play in rural areas, birds were important actors and played roles in the participants' early discoveries of the natural world, including bird trapping and caging. Cynthia vividly remembers: "*I was a very naughty child. One day, my granny took us to the market and bought each granddaughter one duckling* […] *When I came back* [to her place] *the next vacation the duckling was an adult and had laid eggs. I was very excited to see them hatching, so, I was very impatient and I noted a* [nearby] *hen was also incubating* [her] *eggs* […] *and I thought that she was a* [better] *mother… I took the duck eggs and interchanged them for the ones from the hen. When the duck was 'born' the hen believed that the baby was her son.*"

Childhood stories about animals and birds also integrated people as important participants in outdoor play. Together with cousins, neighbors and friends, adults were commonly mentioned in experiences with nature. Elders, for example, were identified as significant (and sometimes permissive) adults who played a key role in both childhood play and developing a close relationship to nature. Younger adults, on the other hand, played the role of monitoring and directing "adventures" such as hikes, fishing or camping, being mostly male relatives, such as uncles and fathers. Participants deeply admired these adults and their examples influenced later careers choices. For example, among other participants, Shon recognizes his grandmother for his love for nature, a feeling that he expresses as "*that attachment*" for the environment and place. The experiences with monitoring adults were more connected with knowledge, as these adults 'taught' kids about nature and animals. Alberto recalled, "*I had a friend who liked science a lot and he had an uncle that was a scientist, and I looked at him and say wow*!" These adults had books and field guides available that were interesting for participants (Figure 4.1).

Places where unsupervised play happened were treasured by participants. They recognized these as very meaningful places, where their "*love of nature began*" through acts of discovery. Russell commented, "*little by little I got to know how* [domestic] *geese 'functioned,' the creeks that crossed and connected allotments. Our neighbor's geese, I recall, always got on our property and fought with our dogs. The geese beat the dogs; we have issues with the neighbors*." The discovery of the farm and bird functioning was strongly associated with how birds were means of **socialization** with neighbours in the countryside, which was widely acknowledged by most participants with similar experiences. Rene described this socialization through the interaction between people and bananaquits (*Coereba flaveola*) and other common birds in rural Puerto Rico, where they are known as reinitas: *...the old people, rural people, people with little education, you go to their homes and they have brown sugar feeders full of reinitas; 30, 40 reinitas in their places and they protected them because they nest on their house windows,* […inhabiting] *closer than any other animal.* [Therefore,] *they identify with them. Everybody talks about reinitas, and also about the Pitirre* [(Grey Kitskadee*, Tyrannus dominicensis*)]*."*

Undoubtedly, physical environment matters for participants' experiences. Participants that lived in more permanently rural or sub-urban settings highlighted the meaningfulness of birds in their everyday lives. Later in their adulthood, they felt that it was a privilege to live surrounded or amid animals and nature. According to one participant, who grew up in Central Chile, *"when I was a*

boy…my street was the last street, and until the […] *stadium, there was nothing other than fields*; *therefore we had birds in the backyard. We saw buzzards and hawks from the backyard* […] *you frequently saw meadowlarks* [(*Sturnella loyca*)] *and blackbirds* [(*Curaeus curaeus*)]*, so they were like 'our daily bread.'"* In contrast, participants that grew up in larger urban centres recognized that urban planning of populous cities, such as Quito or Guayaquil in Ecuador, had few green spaces when they were kids. However, the few opportunities and places for exploration and outdoor play, such as school field trips or visits to naturalized urban areas, were equally treasured and valued. As Javier expressed, "*while my classmates played soccer, I had to 'go'* [exploring] *elsewhere… the harder* [to get there] *the better*." Garth also commented on this need for exploration and place finding in urban areas: "*Running through the urban area, there was a ravine* [where] *I escaped to search for fish, shrimps, birds, lizards*." Nature-based TV shows also played a significant role, especially for participants who grew-up during the 80's early 90's; during what participant Lloyd called "*the Discovery channel syndrome*." Regarding the role of nature-based TV shows, Javier commented: "*We pretended to be Jacques Cousteau and we spoke* […] *with a, supposedly, French accent with my sister and I dressed in clothing simulating neoprene scuba diving suits and we* [dove] *under the bed simulating caves.* [When] *we found shoes, they were rare fish*."

Socio-economic factors and bird relationships during childhood were more prominent at the extremes: in a more rural peasant lifestyle (see quote from Rene above) and a richer suburban living. Regarding the latter, Fritz associated his connection with nature and being "*lucky to have 'something else'* [with nature…] by his comparative socio-economic privilege [Spanish *ventaja*]." Participants with families earning higher incomes were able to access places outside the cities. Loralee also commented that "I *was 8 years old when I joined the environmental group* [… and] *traveled all the time outside of the city, to nearby natural reserves or around the country* [...] *I had the opportunity to know different ecosystems of Colombia since the time I was very little.*" These findings indicate that economic status and child play in nature are correlated.

The findings above fit two models generating human-bird-place relationships during childhood: unsupervised (experience-based) and supervised (knowledge-based) child play in nature (Figure 4.1). The first category includes unsupervised outdoor play in rural and urban areas and indoor nature recreation. The second one includes supervised excursions and guided activities related to environmental education. When these two models are combined, they increase the meaningfulness of bird-participant relationships because such relationships are generated based on both formal

knowledge of natural history or biology and experiences that create emotional connections with people and places. The opportunity to create "experiments" or manipulate nature during unsupervised play also generates experiences of feeling free and being autonomous in nature. Participants seemed to make these realizations during the reflection provoked by the interview process itself, putting together pieces of their lasting bird memories and reflecting how these experiences were influential to them becoming, later on, biologists, ornithologists or birders.
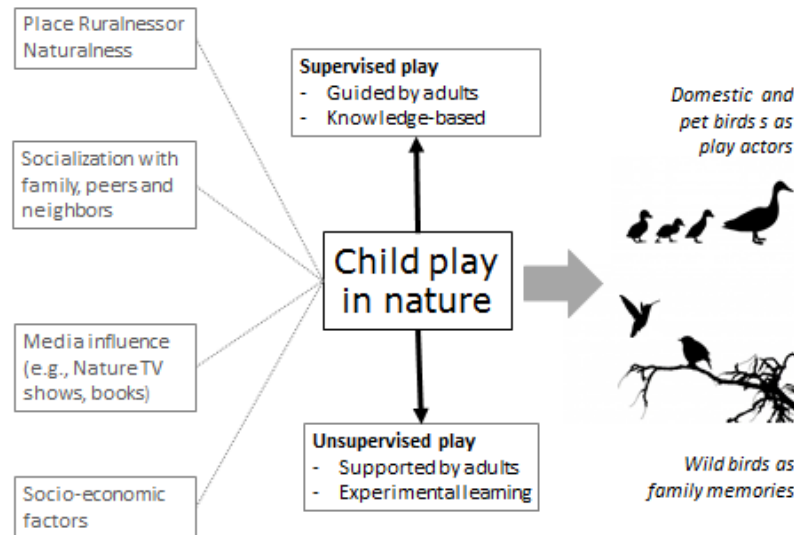
Figure 4.1 Main influencing factors (left, grey boxes) and drivers (center, black outlined boxes) associated with relationships to birds during childhood. This diagram shows factors influencing child play as the main driver of bird experiences and memories during participants' childhood. Child play was reported in two modalities: unsupervised and supervised play, in which adults played different roles in the early connection between participants, birds and nature. As a result of both child play modalities wild and domestic birds were reported widely by participants

4.4.2 Adolescence

Most participants do not recall many meaningful bird or nature experiences from their adolescence. At the end of interviews or during follow ups, this absence of bird memories was verified by specifically asking respondents whether they recalled bird experiences from when they were teens. Indeed, participants did not find any particular reason why this disconnection happened, although the

loss of the social connections involving activities with animals and nature was repeatedly mentioned but not explicitly associated. In some cases, they decided to switch their play in nature to other more 'popular' outdoor social activities, such as sports (e.g., soccer, skateboarding), in which they could make new friends.

It was not uncommon that this step away from birds and nature during adolescence occurred in association with a change of place. Marquis recalled that when he moved from a small town in Venezuela back to Chile's capital: "[our] *move to Santiago was like a 'heavy' change, a big city* […] *literally depressing, but well, with time, I made* [new] *friends.* [...] *By then, I did skateboarding and I was good at that… this was like a breakout for me, and from there, I did not bird again until…I don't know.*"

While some participants declared without many details that they were boy scouts, only one participant kept a strong interest in birds throughout adolescence. He managed to reach adult bird-related social networks earlier than other participants. These networks included relatives and adults belonging to ornithological organizations in the city. "*I participated in UNORCH[2] meetings with my school uniform*", commented Fritz, "*I asked for permission in the school to go birding* […] *we went to count birds to Batuco,* […] *and as I did well at school, they had no problems with that.*" Importantly, these early experiences forged Fritz' self-confidence, being very active in his early adulthood organizing new social networks of students studying and advocating for wildlife. Unlike Fritz, for most participants the connection between social networks and birds was clearer during their early adulthood.

4.4.3 Early adulthood: "The Renaissance"

For most participants, during their early adulthood, their interest in birds did not just reappear, it also 'erupted' with volcanic force. With few exceptions, it seems that during this life-stage the established connection with birds during participants' childhood was reborn from a 'latency period' in their adolescence. Early adulthood was the life-stage in which all participants reported clearer links between birds and their life, including associations to career path or life choice, social life, personal realization and environmental commitment.

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[2] *Unión de Ornitólogos de Chile.* Chilean Ornithologits Union

With two exceptions, all participants chose professions or participate in activities that include birds as a focus. While some respondents specifically studied biology or other wildlife-related careers, others were enthusiastic birders, birding guides, or committed environmental educators and community organizers. Most participants had trouble finding precise reasons for their choices, and some tied their choices to early connections with nature during childhood. "*Since then* [childhood]*...already...I remember that I wanted to be veterinarian,* […] *and this* [interest] *was transferred to biology*", Eura commented. She also commented that this initial interest in birds was seconded by an active and strong social life around birds at the beginning of her university career: "*many of my friends began to have interest in birds.*" Most, if not all, participants reported this linkage between **self-interest** in birds (attributed or not to childhood experiences) and **socialization**, as the two more decisive factors accounting for meaningful relationships with birds during early adulthood (Figure 4,1).

Self-interest and socialization contributed to a third factor, **human agency**, which consolidates a long-lasting role of birds in participants' lives. Participants with peers and friends organized ornithological groups and initiatives about birds and biodiversity, in some cases the first ever created for their home countries. As Ezra highlighted, "*we achieve the organization, in 1995, of the first national ornithological meeting. This was the first event which united all people studying birds* [in the country]*.*" Groups were heterogeneous, although some were gender-focused—"we were mostly women," Kristine recalled. These groups typically operated autonomously from other older adults in higher positions of authority (professors, NGO's directors), although, in some cases, these older adults acted as significant mentors or guides. Participants described their groups as very active organizations that rapidly integrated new members and organized events and, importantly, field trips. The places where these field trips occurred were recalled by participants at the "rural childhood experience level," meaning that they were deeply known, remembered and treasured.

Bird groups that the participants self-organized enhanced a collective **social identity** around birds. For instance, participants took names for their association or nicknames for themselves based on their experiences with birds (e.g., *Queltehue* (*Vanellus chilensis*), *tucuquere* (*Bubo magellanicus*). In some cases, bird groups varied in degrees of formality and nicknames had a playful character that came from humorous anecdotes. "*Yes*, [there is the association] *'OVUM': Venezuelan Ornithologists Miraculously United.* [3] […] *They have become more popular and better organized*". Regarding bird-

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[3] Spanish Acronym "Ornitólogos venezolanos unidos milagrosamente"

species identification, Bradly remembered how a joke ended up being permanent bird identification "*We start* [joking around] *and one friend told me: 'I think that you are like the Neotropical Cormorant* [(*Phalacrocorax brazilianium*)]. *I think you look like it'. From there I was identified as the cormorant for a while.* [A friend] *give me a cormorant* [figurine] *as a gift* […] *I still have it.*" **Playfulness**, no doubt, operates as another important factor in socialization around birds.

Early adulthood's social bonds through birds were extremely strong for participants. It seems that the connection of all above factors combined (self-interest, socialization, playfulness and human agency) tied strong bonds between participants and their friends and peers. Some of these peers ended up being partners, husbands and wives. "I met my wife when birdwatching," Ezra commented. "*There was a fieldtrip with young people from the church* […]. *There was* [a group of] *about 20*, [who] *were one by one giving up. From this group only two friends of mine and she remained. I noted that this girl likes to watch birds, that she enjoys walking and observing nature* […]. *Then I said* [to myself]*: she's the one.*" For these participants, the meaningfulness of birds was extremely anchored to the places and circumstances where they got to know each other, generating an irreplaceable link.

Some participants also recalled field experiences in solitude, in which direct encounters with birds became meaningful as intimate connections with nature. "*I remember that I had to do bird surveys on my own,*" Russell nostalgically recalled; "*these bird surveys were very special…like in those moments, I don't know…in which you are open to many experiences, to let the imagination fly free to daydream.*" Some other participants reported unbelievable experiences of conviviality with birds that created an inextricable link with them. "*We were all day with them*", Josiah remembered his experiences with curassows in the jungle, " [we saw] *what they eat, we saw them hunting snakes, mice, turtles…how they make displays, interact with other species, sound the alarm when the jaguar was around. When the chicks hatched you were part of their family, when a predator was nearby, the chicks quickly hid between your legs, they played with us.*" Several participants reported these direct encounters, especially with owls, hawks and other raptors (see Pizarro & Larson in prep), and all said that these events mark them forever.

Environmental commitment acted as another factor catalyzing participants' interest and socialization around birds. In some cases, participants organized bird groups and initiatives confronting an environmental problem or, sadly, ecological disasters. Chilean participants reported two ecological disasters that involved high mortality in bird populations in 2003 and 2005, and participants from Peru and Bolivia worked in environmental plans to ameliorate the impact of gas and

oil explorations. After these episodes, participants felt committed to improve their knowledge to help solve these problems, feeling that in their home countries "*there is not critical mass* [of people concerned about nature]", as Marquis expressed. Among other factors, participants identified a lack of a well-trained critical mass of professionals, funding opportunities, jobs, and an excess of bureaucracy when pursuing careers and bird initiatives in their home countries. For some participants, the motivation to improve their skills and knowledge related to this environmental commitment was decisive in their move to Canada or the United States to pursue graduate studies or further training.
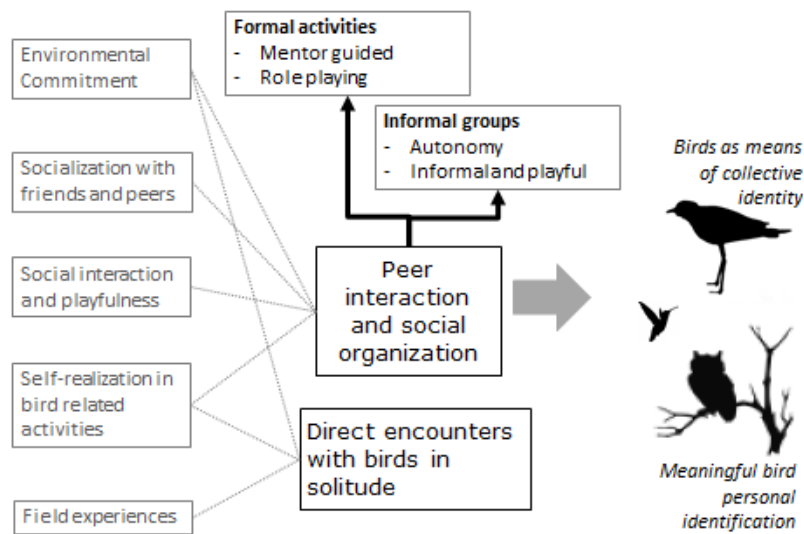
Figure 4.2 The role of social organization and direct encounters as drivers of bird meaningfulness and identity in early adulthood. The diagram shows the most relevant factors (grey boxes) influencing peer socialization and direct encounters with birds as main drivers (center, bold black boxes) of bird meaningfulness. Peer organization was reported in two modalities: formal and informal. Both drivers contribute differently to a collective and personal identification with birds.

4.4.4 The change of place

"Well," Alayna interrupts at the end of the interview – "I read in your [information] letter that you wanted to know how birds could help people to adapt to a new place, or to acclimatise, [to let] the cultural change be more…less drastic" She emphatically states: "For me […] to go birding and

enjoying nature is something that makes me super happy. I think that for that reason the change of country wasn't drastic at all because I kept enjoying nature and, especially, the birds."

Certainly to feel "happy" and have the capacity to "enjoy" birds and nature was commonly associated by participants with successful adaptation in the new place. How Alayna emphasises the fact of "keeping birding" also reveals that this place adaptation includes the continuity of activities (e.g., birding) and identity (e.g., birder) related to birds. However, participants widely recognized factors both limiting and favouring this identity continuity, mostly related to social interactions with peers. As mentioned, for most participants this socialization through birds marked their early adulthood, life style, and partner and career choices.

In relation to physical factors of both built and natural environment, participants recurrently mentioned the scarcity of public transportation to reach natural areas and reserves in the US and Canada; "*you know, they all have cars here*" Lloyd said. They also recognize also the great infrastructure of trails in urban parks that contrasted dramatically with their experiences with urban nature in their countries of origin. This contradiction was overcome, in most cases, with the acquisition of a car or the adoption of alternative methods of transportation such as biking. Either way, this mobility limitation keeps most participants confined to more urban and local experiences of birds and nature. In this respect, Chan states: "*well, we have explored obvious places such as Paines Praire, but not much further, because we don't have a car* […]"; and Alyana also said "*I just go nearby to a place,* […] *biking you take about 15 minutes and it is a little park. It's full of birds.*"

The perception of bird diversity was uneven between participants. While some found the new place's bird assemblage highly diverse, others found it poorer, and somehow boring, especially those participants from megadiverse countries such as Venezuela and Peru: "*Just crows!*" Ezra declared. Despite this disparity, most participants find North American birds interesting for several reasons, including the singularity of the species assemblage and the relationship between observing familiar and unfamiliar species. For example, Fritz, Lloyd, Marquis and other participants, were amazed at how easy it was to see and interact with raptors in Florida, which they contrasted their experiences with raptors in their home countries (See a full account of bird species associations in Chapter 3). This finding related to bird diversity and place experience suggests that pessimistic attitudes with local birds might be related to other factors.

Main social factors included language barriers and the ability to reach or enact new bird-related social networks. Language barriers can be interpreted in two ways, as barriers to clearly communicate

with others (e.g., English native speaker birders) and obstacles to memorize and manage bird names in English. Both kinds of language barriers re-enforce one another. "*There are new birds and new words*", as participant Alayna significantly stated issues related to "cultural or social language", such as interpreting by-law signs were also identify. The experience of Rene is quite enlightening: "*I didn't know that I was into the reserve and came to an intersection that said 'do not pass'* [trespass] *but I misinterpreted that it was for cars* […] *Well, a patrol arrived and they were getting me inside* [the vehicle]*, the park rangers, there are cameras* […] *The ranger ask for my ID, and I didn't have one; I had only my binoculars and bird guide with me. 'I'm a nature lover', I said, 'I'm not doing anything wrong;'* […] *they checked if I had any criminal record.* […] *he said "next time we find you here we are going to arrest you.*" Marquis also reported a similar event, in which he and two friends stopped on their way to ask two birders what they were looking at, and the birders got scared—thinking that he and his friends were about to rob them. "*You don't look like birders' one the ladies said to me*", Marquis reported. Participants reported feeling conflicted and troubled when this kind of event happened.

Birder participants frequently commented about differences in Latin American and North American birding style. They felt that Latin American style was more social in nature, evoking (and maybe craving) the good moments that they had with peers and friends on birding outings during their early adulthood. They found North American birding to be too task- or goal-oriented, and extremely competitive, lacking in the playfulness that was so important for their previous experiences (Figure 4.3). However, the few who adopted North American birding ─"*get the deal*", as Marquis said─ or hybridize both styles gained meaningful bird experiences and cultivated a positive attitude towards birds and their new place.

4.4.5 Mid-adulthood–present: birds and family values

"*At the end…it's a value issue*" Fritz commented when narrating an experience of rescuing an unfledged Austral Thrush (*Turdus falcklandii*) chick with his son. "*Indeed,* […] *in my mom's house there was a* [lost] *thrush chick. We found it and took care of it and give it water...maybe the thrush chick ended up dead anyways,* […] *but it's important that* [my son] *has compassion for that, and whatever it is that he wants to do in the future, at least* [he] *values birds.* […] *Birds are things that bring joy to your life, and a forest without* [birds] *is dead* […] *it doesn't exist.*"

At the time of the interview most participants were in their mid-30s. Some of them were married and had children. Participants with families emphasized that transferring relationship and love for

birds to their children was an important parenting task. They proudly narrated their children's early bird encounters and they considered that experiences with nature were something to include in their family life as an ethical value beyond mere "heritage" of professional paths or choices.
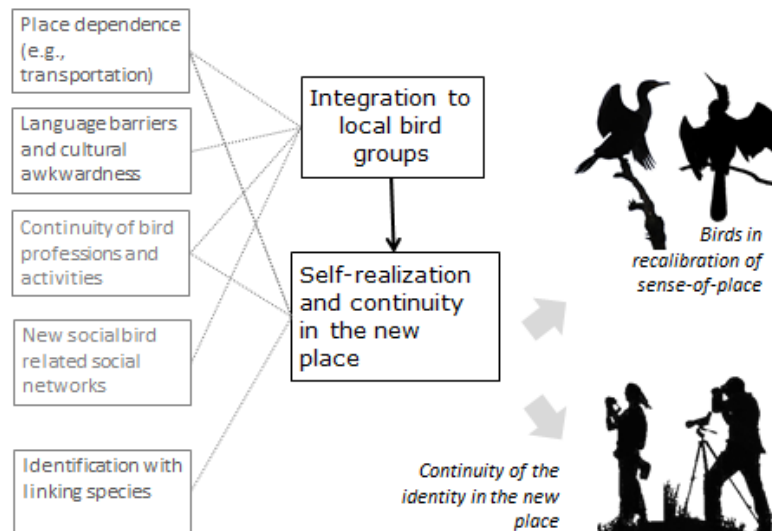
Figure 4.3 Self-realization and identity continuity drive immigration experiences with birds. The diagram shows the most relevant factors (grey boxes) influencing the two main drivers of bird meaningfulness during the change-of-place. Birds were means of integration for participants in the new place, by helping enhancing their place experience and integrating to a new social life. Both components were relevant to participants' self-realization and continuity of their identity in the new place

Both singles and participants with families connected their bird experiences with broader cultural roots. For example, during interviews, when I asked why they considered birds an important aspect of their lives, several participants connected indigenous narratives and stories about birds that they heard when they were kids. "*There is a legend that Aimara people tell*, Chan remembered, *of a bird that was bigger and more beautiful than the* [Andean] *condor* [(*Vultur gryphus*)]. *The condor envied his shine* [and beauty]. *One day the condor ambushes and kills and smashes the bird. From each one of* [his] *pieces, a different kind of hummingbird was born*" The connections between their current life and indigenous background revealed an interesting cultural connection between participants and birds.

Besides family and cultural values, participants also attributed birds with more-than-aesthetical values. "*Birds are super-interesting for me, and also they are beautiful. I have had dreams with birds* […] *I don't how to describe it…birds are like ever-present, always*" (Kristine, Bolivia). Some participants specifically stated that their love for birds and nature is somehow linked to a spiritual life that, together with family and cultural values, enacts their worldviews. Lloyd declared "*If I have to define my relationship with wildlife, nature or with birds, for me it is more…more than professional…it is, at this point, more spiritual, a comfortable place; it is emotional.* […] *I found an emotional maturity in my relationship with wildlife,*" he added.

4.4.6 Political factors

External social and political factors affected participants' relationship to birds across life stages. To the previously mentioned influence of TV shows during childhood, there is also the influence and trauma of military interventions and politically forced displacement. Three participants lived their childhood in a different country because their parents were exiled—during, for example, the Pinochet dictatorship in Chile. Chilean participant Marquis lived most of his childhood in Venezuela. He remembered "*the problem was that* [early on] *my dad was really paranoid, maybe because the things that were happening in Chile during that time.* […] *He allowed me to be outside just for an hour. So, I had not many options to* [play] *outside. But we had very good neighbors.*" These traumatic experiences initially limited child play in nature that, as shown earlier, was critical for primary foundation of participants' bird relationships. To feel that their kids are safe playing outdoors, therefore, is one of our participants' concerns right now, as adults.

Colombian participants remarked on the further and complex impact of the conflict between the National army of Colombia and the Revolutionary Armed Forces of Colombia (FARC, in Spanish). In this case, beyond the problem of feeling unsafe in nature, participant Josiah highlighted a broader unexpected effect. He opined that "[t]*he advantages and disadvantages of the Colombian armed conflict were that we Colombians had to do everything, create initiatives and manage projects* [for ourselves]. *It was not like I've see, in Panama, Costa Rica and Peru* [where] *a lot of foreign people go* [to do research]. *They,* [the local people], *see it more as a job and not so much like … they don't have much 'love' for it* [research]." Josiah explained that foreign researchers found it unsafe to do ornithological research in Colombia back in the 1980s or 90s. This phenomenon created an isolation of Colombian ornithology with both positive (strong identity and autonomy) and negative (lack of funding and research topics) effects.

4.5 Discussion

4.5.1 Progression in bird meaningfulness through participants' life stages

Participants' experiences with birds can be seen, altogether, as a continuous process from childhood to the present day. Certainly, there are discontinuities in this process (e.g, in adolescence) and remarkable difference among participants; however, the consistency of their narratives facilitates the authors' tracing generalizable trajectories about the progression of bird meaningfulness (Figure 4.4). This progression accounts for the importance that participants attributed to birds in different stages of their life, either directly, e.g., by naming specific species or bird pets; or indirectly by socializing through them. Birds gained particular notoriety when both direct and indirect meaningfulness work together. This highest level of bird meaningfulness was achieved in participants' mid adulthood, when they considered birds as important carriers of social values and cultural heritage, seeking to instill these ethical values in their children education.
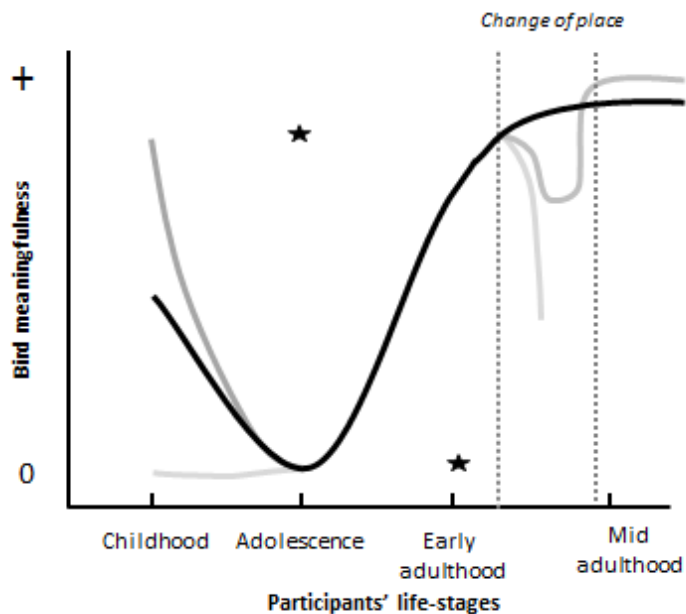
Figure 4.4 Trajectories of bird meaningfulness progression through life-stages from qualitative data. Black curve represent the most generalizable trajectory, while dark and light grey represent the most common alternatives described by participants. Outliers are represented by stars. The moment of change of place is represented by the portion between dotted lines, and located after early adulthood to fit with most participant histories

Many other trajectories of bird meaningfulness are possible, and some of them are depicted in Figure 4.4. These alternative trajectories may include particular events or situations that, for example, reduced bird meaningfulness. Limiting factors and events, such as lack on integration, socialization, unsupportive or hostile social environment, can deeply affect people-bird relationships during transitional times in life, such as the change of place or the transition into adolescence. This finding is consistent with place literature addressing the relevance of social networks and bonding for place attachment (Hernández et al. 2007; Sampson and Goodrich 2009; Scannell and Gifford 2010). In general terms, social inclusiveness has been identified a critical step fostering the positive attitudes of immigrants and adolescents to integrate the new place (Wilson-Forsberg 2010; Tartakovsky 2012). In this sense, socialization can understood as an especially critical factor during hard identity transitions and adaptations, such as adolescence and immigration (Proshansky 1983). Therefore, the attachment with biodiversity, represented by birds as active place components, follows the same pattern.

4.5.2 Is this (human-bird relationship through socialization) a cultural thing?

Birds are meaningful components of the lives of participants. Their relationships with birds were dynamic, with 'ups and downs.' Despite this variability, the combination of socialization and human agency (or its absence) played a steady role across their life stages. It was shown how these socialization-agency combinations, such as child play, social organization, and parenting, drive bird meaningfulness and significant human-bird relationships. With all participants originally from Latin America, one may ask whether the relevance of socialization- agency drivers can be "a cultural thing", a non-generalizable finding of how Latin American culture relates with nature. This question can be answered in different ways, and that those answers ultimately have strong implications for the possibility of designing pro-social integration environmental education programs.

Our results can be generalized to a larger cultural scale. For instance, pro-environmental behaviour, in general terms, is strongly linked to the socio-psychological factors of intention, personal moral and social norms (Bamberg and Möser 2007). This triad (values, intention to act, and socialization) is very similar to what was it found in mid-adulthood bird relationships. In addition, Chawla (1998) found that formative experiences are strongly associated with an environmental sensitivity in adulthood, a tendency to learn and act to advocate for environment. These formative experiences included childhood experiences in nature, experiences of environmental destruction, pro-environmental family values, belonging to environmental organizations, the influence of role models (friends or teachers) and, to a lesser extent, formal education (Kollmuss and Agyeman 2002).

Childhood unsupervised play in nature, indeed, has been linked not only to pro-environmental behaviour but also to a strong place identity and cultural and political activism (Johnson et al. 2009).

At the same time, a strong emphasis on socialization and agency can be seen as a cultural particularity. Latin America (LA) is a complex ontological, political and geographical construction that collectively identifies people who live in several countries of the Americas. The idea of a LA cultural identity is broad and difficult because it mixes together the legacy of hundreds of indigenous nations and the colonial Spanish, Portuguese and French empires, among many other foreign cultural influences. However, LA nation-states share similar trajectories, including recent external political and military interventions linked to natural resource exploitation by multinational companies (Gudynas 1989; Latta and Wittman 2012). The legacy of indigenous relationships with nature (and birds! see Ibarra and Pizarro in press, Ibarra *et al.* 2012; Chachugi 2013) and of local citizen environmental movements, is therefore suggestive of a certain particularity to LA human-nature relationships. This particular nature worldview can be tied to social, genetic, linguistic and cognitive pathways connecting place and nature (Toledo and Barrera-Bassols 2008). Accordingly, some participants reported difficulties enacting social connections around birds and nature in their new places, for example when a cultural difference around bird observation habits in USA and Canada had moderated effects on participants' own relationships with birds.

4.6 Final remarks.

Beyond cultural specialties and disparities, the analysis of immigrant-bird systems provides an important meeting point for people and nature in their new places. Birds can provide a concrete connection between people and place that can be encouraged through outdoor activities of environmental programs that also seek to integrate immigrants living in highly urbanized environments (Alves et al. 2005; Lovelock et al. 2011). However, the findings of this research suggest that connection with place and nature could be ineffective in producing people-nature bonds if components of socialization and human agency are not included in such activities and events. In that regard, environmental education programs directed to immigrant and city-bound populations should provide avenues for people to self-organize, for example allowing environmental leadership to emerge among newcomer communities. In parallel, local birdwatching and nature groups should reach out to newcomers and, at the same time, help people to re-enact their social connections and recalibrate themselves in place by being aware of animals and plants in their surroundings (Chapter 3).

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Following upon claims about the extinction of experiences of nature resulting from social change (e.g., Miller 2005), researchers need to consider whether this disconnection between humans and nature is caused by a lack of genuine socialization between people and nature, especially a lack of socialization between long-term residents and newcomers. Accordingly, we need to improve inclusiveness and representation in our local environmental programs and activities, not only by increasing minority participation but also by creating activities designed to promote socialization between participants. Indeed, this research shows how birds, in ideal situations, can help people to connect with nature, others and themselves.

Chapter 5

Feathered memories: An autoethnography about birds and identity

5.1 Abstract

As conspicuous components of biodiversity, birds represent connections between place and identity for the vast majority of cultures across human history. However, recent accelerated human mobility has considerably changed the way of living of a large proportion of humankind. Despite contributions from environmental psychology and cultural geography, it is unclear how immigrants, dealing with drastic changes, sustain identities linked to both place and nature, and how concrete components of nature and place operate together in the process of identity-making. Moreover, the unique charm of human-bird relationships suggests that there is also an intimate layer of that connection that needs to be explored more deeply. As an immigrant and ornithologist, I used autoethnography as a method to re-examine my existing connections with birds and mobility experiences (moving, immigrating) to better understand who I am. Beyond static "sets of meanings," I found that my identity is a researchable, active, open and dynamic process in which memories of integrated birds-events-places play an important role as points of reference. Tracking these memories as units, I was able to reconnect my life and identity even with my ancestry and gain access to a broader identity that is constantly expanding. Considering identity in this way, I briefly discuss the limitations of existing frameworks and present biocultural memory as an alternative. From this research, autoethnography emerges as a powerful emancipatory tool for studying of identity linked our personal history and relationship with nature.

Keywords: memory, birds, identity, sense-of-place, colonialism.

5.2 Introduction

The presence of vultures perching in a place is so evident that you can even smell it. In September 2013, a dozen Turkey Vultures (*Cathartes aura*) roosted every evening over the tallest trees of my neighbourhood in Waterloo, Ontario. In a week, a few dozen birds became hundreds. At that moment, I asked myself if I had seen the flock of vultures the previous fall, but I could not remember it. Unbelievably, I must have previously missed hundreds of huge black birds, with a wingspan of 1.8 m, flying back and forth from my neighbourhood, in which I had lived long enough since I moved from Chile to Canada in 2011.

Unlike vultures, I noticed crows soon after my arrival in Canada. Crows are vocal. In winter, hundreds (if not thousands) of them massively gather at Waterloo Park every day. In the park, they perch over the naked tree branches, creating a spectacle with their black silhouettes contrasting against the glossy night sky and the white of snow, cawing and cawing endlessly (Figure 5.1). Just a few weeks after arriving, I learned that people in Canada call these gatherings "a murder of crows." In a sort of winter drama, I associate murders of crows with the emotions of long, hard-working days. I recall seeing crows coming to roost at the park, as I waited for the bus park cold and tired after a long day. In spring and summer you see mostly scattered crows fixed at their nesting sites. Why could I easily remember crows instead of vultures, both being large, black gregarious birds? Undoubtedly, among other birds, both vultures and crows moved something powerful though contrasting in me.

The same "vulturey" fall, I felt that the time just flew by. I remember saying goodbye to the last of the vultures in late November. By December they were all gone and the crows were already gathering in massive murders. I noticed that the transition between feeling the absence of vultures and the presence of crows triggered something in me, like an "in-ward" reflexive state. Since then, I have begun to more accurately perceive a rhythm, a semi-synchronized suite of events marked by absences and presences of birds between seasons. It was not merely an issue of perception change: I finally felt I had started to build a narrative about me and this new place, a story-telling, bird by bird.

Being myself an ornithologist, it was unacceptable that I had missed the vultures in 2013. However, I learned as a social scientist that cognitive processes (e.g., remembering, knowing) are intimately linked to emotional connections and the perceived functionalities of places (Kyle et al. 2005). Moreover, these cognitive, emotional and functional bonds compose a larger, complex human faculty called sense-of-place (Tuan 1977; Relph 1997). Places, furthermore, comprise not only built landscapes, but also the natural and social environment represented by biodiversity and people. Accordingly, I theorize that birds, as conspicuous components of biodiversity, can prompt processes of place-making and connecting oneself with nature and other people. However, what happens when we move from one place to another? What happens to the connections we have with our place(s)?

Figure 5.1 Turkey Vultures (*Cathartes aura*) soaring over my neighbourhood (upper picture, Fall 2013) and a murder of American crows (*Corvus brachyrhynchos*) in Waterloo Park (bottom, Winter 2012) in Southern Ontario, Canada. Photo author

As an international student in Canada, I became aware of the process of transnational mobility and immigration. I learned that social scientists have identified a new paradigm, the mobility turn (Blunt 2007; Cresswell 2011b), which signifies a shift away from a 'sedentary' perspective on how the social sciences study humans. Indeed, after WWII, societies became increasingly dynamic and

cosmopolitan, as humans became more and more mobile, both physically and mentally. Social drivers of change such as massive global transportation, instant global communications, transnational immigration and global markets interact to produce a very different kind of cosmopolitanism than the one exhibited in previous historical moments (see Chryssochoou 2000; Blunt 2007). This social change has been accompanied by an equally accelerated human-made environmental change, including climate and ecosystem change (Ellis 2011). The unseen speed of ecological change leads philosophers and scientists to propose to call our time the Anthropocene, a new era characterized by a human-driven planetary social-ecological change (Crutzen 2002; Lorimer 2012; Lewis and Maslin 2015). To date, however, the dynamics of nature and people in the Anthropocene have been mostly studied from a sedentary perspective. This perspective logs ecosystem change against a static and overly-generalized conception of human society without considering the social challenges created by todays' human mobility (see Gustafson 2001; Cresswell 2011).

Since that fall in 2013, vultures started to more vividly populate the sky of my early mornings and late evenings at my new place in Canada. With their far reaching wings and classic V-shaped silhouettes (Figure 5.1 A), they nostalgically reminded me of other skies and stages of my life in Chile (as the distribution of Turkey Vultures ranges from Southern Canada to the southernmost tip of South America). I noticed that vultures prompted vivid memories and images, not only of other landscapes, but also of other people and myself in another time and space. In the linkages between my bird memories in Chile and bird experiences in Canada, autoethnography emerges as a method (Chang 2008) to investigate the deep connections between self, biodiversity and place in the context of human mobility in the Anthropocene.

I propose birds as proxies for our current relationship with place and nature, as they can represent an incredible range of socio-ecological situations. For example, from the Arctic tundra to southernmost Tierra del Fuego, birds are conspicuous animals that live in every ecosystem, including cities. For immigrants, birds can therefore represent "points of reference" between the physical environments of their place of birth, of the lands where they eventual settle, and locations in between. The taxonomic fidelity of this familiarity can vary: immigrants in the Americas can find the exact same migratory species, or similar birds in appearance or behaviour, or even completely new and different birds (Chapter 3). A parallel connection can be established between birds and culture, as they populate the symbolism of the majority of western, eastern and indigenous cultures (e.g., Mynott 2009; Tidemann and Gosler 2010; Ibarra et al. 2012; Cocker and Tipling 2013), and participate in

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very specific ethnic or cultural practices, including bird keeping, trapping and birdwatching (Sheard 1999; Jerolmack 2007; Jerolmack 2009).

For an individual such as myself, birds can help to understand the nuances of experiencing immigration as well as the relationship between biodiversity and sense-of-place. In this way, I aim to contribute to the study of the complex intersections between "identity, mobility and place" that largely concern human geographers, sociologists and environmental psychologists (Gieryn 2000; Head and Atchison 2008; Kyle et al. 2014). Identity, for example, is a personal and complicated issue that seems even more contested in the Anthropocene, where people feel anchored to multiple locations, and question the idea of "one single" place identity and sense-of-place (Gustafson 2001; Blunt 2007; Manzo and Devine-Wright 2014). I add to this question the problem of how biodiversity, represented by birds as place components, participates in place- and identity-making processes, knowing that we have largely adopted birds and other animals as symbols of our cultural identity through history (Mynott 2009).

In this paper, I investigate how birds participated in important events of my life in Chile and Canada, and how the active reconstruction of these memories and experiences can help me better understand my identity as an open, active and dynamic process. I used autoethnography as a reflexive method of collecting and analyzing biographical data and also wrote from the autobiographic perspective in which I am simultaneously, key informant, researcher, and researched (Hammersley and Atkinson 2007; Chang 2008; Davies 2008). Accordingly, I adopt a narrative writing style, one that recounts the stages of my life from a first-person perspective. In the first section of the results, I present key memories about birds and events that I consider important for the connection between my identity and place in Chile, combining a timeline with a culturegram (Chang 2008) in one single fluid diagram. In the second part, I narrate bird encounters in Canada from more recent self-observation, including issues of immigration, such as social life and self-realization. I discuss the connection between memories in Chile and Canada by drawing upon existing theories of and topical research into place identity (Proshansky 1983; Kyle et al. 2014) and immigrant-nature interactions (Buijs et al. 2009; Peters et al. 2010; Jay et al. 2012). Finally, I present the concept of biocultural memory (Toledo and Barrera-Bassols 2008) as a concept that helps to weave together identity, place and biodiversity.

Methods

In general terms, autoethnography (AE) is a method of self-reflective thinking (and writing) that connects data from autobiographical sources to wider theoretical or topical cultural, political, and

social contexts (Chang 2008). This method carefully considers the symbiosis between the social and the individual, the personal and the political, avoiding the pitfalls of self-indulgence or self-righteousness (see Hammersley and Atkinson 2007; Davies 2008), and violating privacy and/or confidentiality of the identity of people mentioned in autoethnographic material (Tolich 2010). Accordingly, I see AE as an opportunity to reflexively collect and connect my own feelings and thoughts, not only within the social domain but also in regards to the environment, using birds as "points of reference" of place and identity (Paper 2). To provide generalizability and validity, I combined narrative-descriptive and analytical-interpretive ethnographic styles to present results and draw connections to the literature, respectively (Chang 2008; Davies 2008).

This AE represents the final stage of four years of research, and involves the continuous and opportunistic collection of data from past and recent experiences with birds in Chile and Canada. I employed several methods of data storing including freewriting, hand notes, and digital notes using Evernote (v. 5.8). I organized these data in three categories: personal memories, self-observations, and external data (Table 5.1, Chang 2008). Personal memory data includes information gathered after the process of purposefully remembering places, events and birds, including how I saw myself then and now. Self-observations consider my interaction with others during bird-related activities and everyday life; self-observations were especially useful for documenting immigration experiences. For data triangulation and verification, a category of external data comprises pictures of birds and places from my personal photo bank, bird lists and notes from birding outings and personal documents and publications (Hammersley and Atkinson 2007).

I used different strategies and devices to organize and analyze data (Table 5.1, second column). I stored memorable events, birds and people in a timeline, and different aspects of my identity in a culturegram (Chang, 2008). Timelines are useful portrayals of events and places in chronological order; culturegrams are diagrams depicting and organizing different categories of a person's identity or cultural background, included but not limited to gender, ethnicity, language, religion and other forms of belonging (Figure 5.2). Since the objective of this paper is to investigate the relationship between features such as events, places and identity in the context of mobility in time and space, I chose to integrate both diagrams within one figure to show identity overlapping events, life-stages, significant birds and places.

Table 5.1 Three categories to collect and organize autoethnographic data (adapted from Chang, 2008)

Data category	Methods	Lean code
Personal memory data	Timeline and culturegram	Relevant bird species
		Places (ecological and social settings)
		Cultural identities
		Interests, professions, occupations
Self-observation data	Participatory and non-participatory observations	Interactions with others
		Changing self-perceptions and attitudes
		Changes in lifestyle and livelihood
"External" data	Data triangulation and verification	Pictures
		Documents and publications
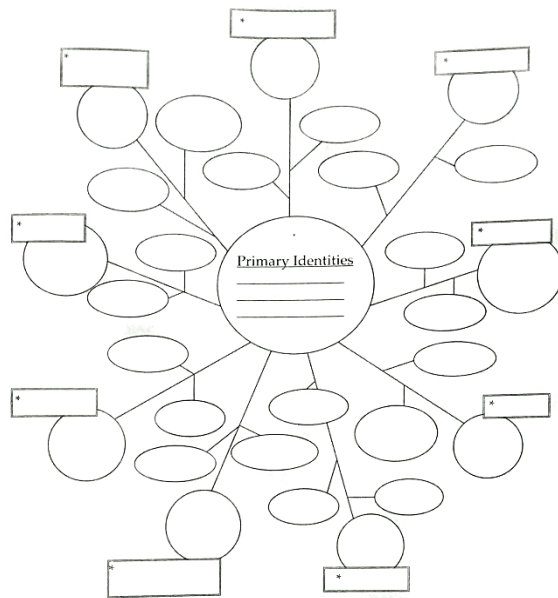
Figure 5.2 Culturegram example modified from Chang (2008). Culturegrams allow research participants to identify their primary identities (center oval) and define different categories of secondary identities or belongings in the smaller branches.

In order to protect other people's privacy, I narrated my own stories and events while seeking to avoid identifying other people. I protected their anonymity and confidentiality by not using their real

names or exposing details that could identify them. The only exceptions to this are family members and friends from whom I obtained verbal consent (Tolich 2010).

5.3 Results

5.3.1 Feathered roots: personal memory data

Who am I? The first time that I asked myself this question, in 2008, I was 29 years old. It happened in the aftermath of a field workshop about birds in Robalo Bay in Navarino Island (55.07°S 67.66°W), Southern Chile ─"Beyond the end of the world," people said. By 2008 I had finished my Master's degree and was working there as an ornithologist and environmental educator. I taught high-school kids to identify birds that inhabit the Sub-Antarctic ecoregion, such as the beautiful Kelp Goose and the Flightless Fuegian Steamer Duck (Figure 5.2 A and B). One of my favorites is the Chimango Caracara (*Milvago chimango,* Figure 5.2 C), which connects marine and terrestrial ecosystems, transporting marine nutrients from the coastal area to the forest interior (Pizarro et al. 2011). After the workshop, a friend and I stayed longer at the bay to collect edible seaweeds (*Ulva spp.*). This collecting is a traditional activity for indigenous and other traditional coastal communities.

While barefoot and walking along picking seaweed from the rocky bay, my friend was telling me stories about her early nomadic indigenous life and boat travel around the archipelago with her family. She belongs to the Yaghan community of Navarino Island and has ancestral roots in the remote Cape Horn archipelago. I found nothing to share along these lines because I had never asked myself where my ancestors come from. I just barely recalled some conversations with my grandmother who lives 4000 km north of Navarino, in the city of La Serena.

I decided to speak with my grandmother to inquire further into my history. I was born in La Serena, a coastal town in semi-arid North-Central Chile (29.9°S, 71.25°W). It is the second "oldest" city in the country; I hesitate to say "oldest" because it was the second city "founded" by Spaniards in 1544, but there were of course thousands of years of previous human history in this place. In any case, I did not know whether my ancestral roots were in La Serena or somewhere else, and asked my paternal grandmother if she or any of her siblings or cousins recalled where our ancestors came from. Surprisingly, she remembered very little about her grandparents' history. My only verified ancestors, so far, belong to a small agricultural community, called La Cebada, about 150 km south of La Serena. They herded goats and migrated from the community to La Serena at the beginning of the 20th century, looking for opportunities after a severe drought.

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Figure 5.3 Sub-Antarctic birds from Southern Chile representing my search for identity. In the upper left (A) a pair of Kelp geese (*Chloephaga hybrida*); the female is black and the male white. In the lower left (B), a pair of Fueguian Steamer Ducks (*Tachyeres pteneres*) plowing Robalo Bay waters. In the upper right (C), a Chimango Caracara (*Milvago chimago*) perched over a kingcrab (*Lithodes santolla*) trap in Puerto Williams, Isla Navarino, Chile. The lower right picture shows Navarino Island's landscape from the coast to the mountains. Photos by author, 2008.

Before traveling to Canada, I organized a trip to La Cebada with my grandmother, my dad and my wife, looking for lost relatives and clues to our origins. In La Cebada, we found a cluster of houses along the busy Pan-American Highway. We started a conversation with the first (and only) person we met there. He told us that Pizarro, our last name, was very common in the area, and actually it was his. We opened our eyes thinking that we had found something. However, he quickly added that his last name doesn't mean anything to him really because his mother took it from the hacienda owner where she worked. He also told us that the community, once very well organized, was dismantled by

corporate lawyers of the Spanish company that built the highway, which split the community in two. In a nearby village, we encountered another "Pizarro" who told us a very similar story. I discover that my own story illustrate a larger heritage of colonialism and more recent developing models Latin America (Toledo and Barrera-Bassols 2008; Gudynas 2009b). I felt angry and disappointed, and decided to postpone the search; I would not get any closer to my ancestry searching by last name. La Cebada and many other autonomous agricultural communities in the area were dismantled after Pinochet dictatorship in 1973 that establish the conditions for neoliberal economic systems in Chile (Schneider 2007).

Despite my frustration, I felt that my journey had begun. By chance or not, it had started after a bird workshop in southern Chile. Indeed, working in Navarino as an ornithologist, I noted that when I talked with people randomly about birds, the conversation typically ended on a personal note, concerning family or friends. When talking about birds it was easy for people to open up and speak out, and I started to think that, for some reason, birds must be linked to people's intimate life, and that we are most of the time unaware of such connections. Thinking this way, Sub-Antarctic birds (Figure 5.2) not only represent my identity or self-realization as an ornithologist, for they also became linked to my search for identity and ancestral roots in Chile.

When I started indexing my bird memories and events in the culturegram-timeline (Figure 5.3), I noticed that they overlapped with identities that I was progressively gaining after new experiences. However, I also realized that particular events, such as the conversation in Robalo Bay, provoked in me a different effect from similar interactions: this conversation made me re-evaluate the foundations of my own identity, including my connections with birds in today's context. For example, prior to re-examining my early connections with birds, I had always declared myself a city boy with no connections to nature and birds. I was wrong. The more I reflected on my upbringing, I realized that my happiest childhood memories are deeply associated with summer and the ocean.

La Serena has seven kilometers of sandy beaches where I spent most of my summers alongside my parents, uncles, and cousins. Marine birds were the soundtrack of my childhood adventures, and I recall listening to calls of Kelp Gulls (*Larus dominicanus*) and whimbrels (*Numenius phaeopus*). When swimming, I enjoyed seeing pelicans (*Pelecanus thagus*) and Peruvian boobies (*Sula variegate*) dive-bombing for fish from high up in the sky. I just did not know which particular species they were, but at that point, who cares! I remember too, how interesting it was to find a bird carcass in

the sand and speculate causes of death. Re-examining these events confirmed my early affinity for birds and made it easier to understand who I am now.

As an immigrant, the image of vultures and crows in Canada evoked meaningful memories of birds of my early adulthood. At the age of 18, I moved to Chillan (South Central Chile, 36.6°S, 72.1°W) for six years to study Veterinary Medicine. The city, the landscape, the weather, all was different. In Chillan I learned to cope with the rain and cold, to understand the blooming sensation of spring, and the drought of summer. Located in the Intermediate Depression between the Andes and the coastal mountain range, there was no ocean, yet the rhythm of seasons took its place. Like the crows in Canada, Chimango Caracaras congregate in hundreds to roost in the tallest trees of the Chillan university campus. These caracaras gave me my first publication as a researcher (Pizarro and Gonzalez 2001).

Beyond research, in Chillan I also learned to cope with my own life and responsibilities. I lived intensely and understood that time is relative. My deep friendships, passions, interests, and my daughter were born in that place, in that short period of my life. I discovered my interest for life-sciences and animals. I did all I could to learn, and rapidly set my passion on wildlife conservation. I was a teaching assistant of zoology and ecology and participated in a nascent fauna rehabilitation centre. I learned to use binoculars to watch birds at the same time that I learned about the power of social organization by creating a wildlife research student group with peers and friends. I recall many birds from that period, but there are a few that marked my life. The main one was a Barn Owl (Tito alba) we called Sofia. She was an abandoned chick we found in an air duct of the campus gym. We fed her every day, taught her to fly. I named my daughter after her; one of the most wonderful discoveries of my life is that one of my friends did the same, years later.

From Chillan's caracaras, my new researcher identity continued on with the study of Magellanic penguins (*Spheniscus magellanicus*) in Southern Patagonia. A popular myth states that "Whoever eats Calafate berries (*Berberis microphylla*), will return to Patagonia." I ate lots of those berries while I was surveying penguin colonies for my undergraduate thesis work. Seduced by the melancholic Patagonian landscape and its particular biodiversity, I moved with my family to Punta Arenas for my first job and my Master's degree, and that is the point where the story connects to Navarino Island and Sub-Antarctic birds. As the educational path of many of my colleagues of my generation, I decide to continue my graduate education overseas, and I moved with my family to Canada where I pursued my PhD.
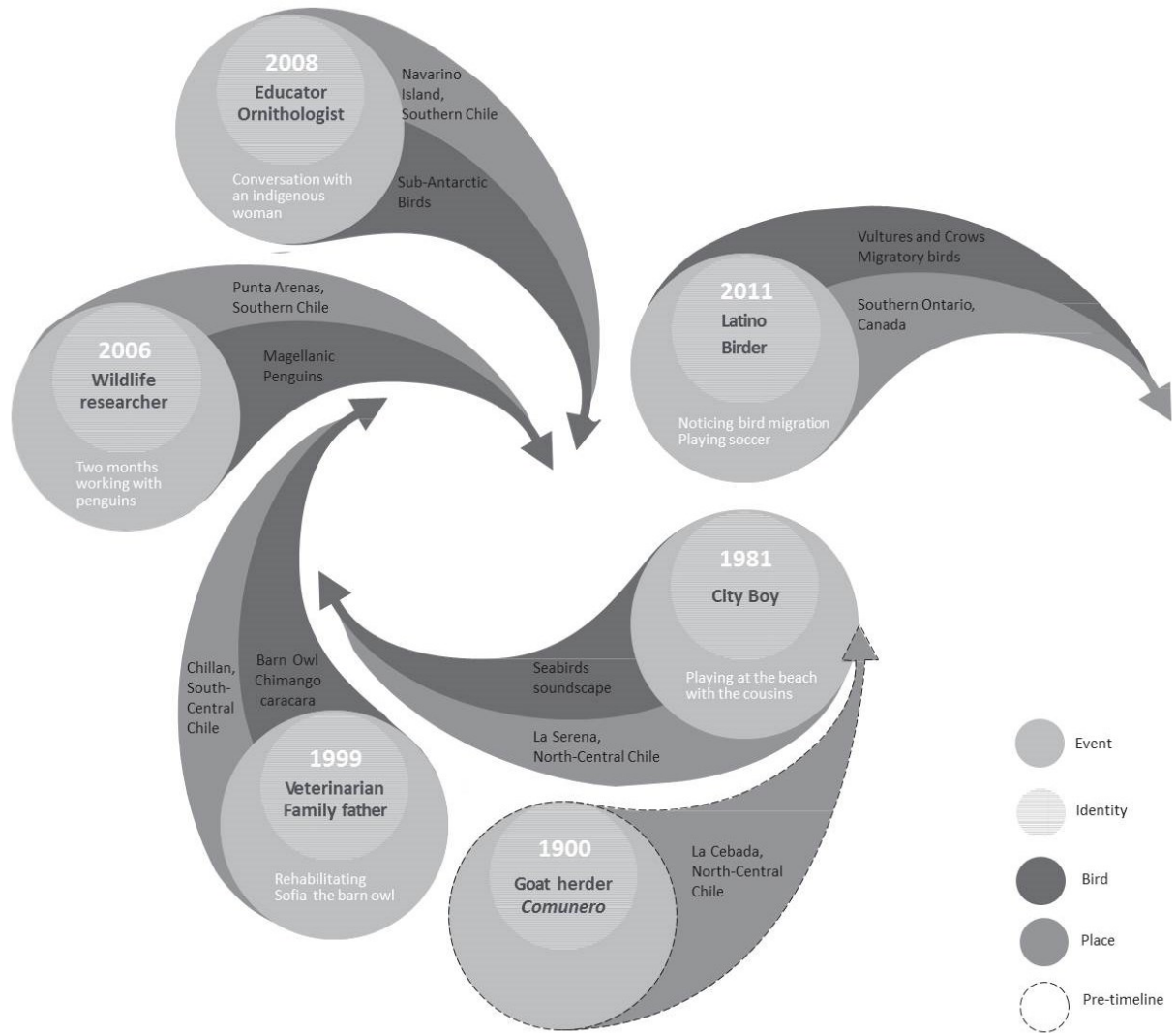
Figure 5.4 Culturegram-Timeline of birds-event-place memory units. Arrows denote concentric and eccentric (located elsewhere than at the geometrical center) processes of identity-making that reveal the dynamism of identity in response to changes of place. By the active exercise of remembering, I could track memory units that pre-dated my birth and connected with other broader yet unexplored biocultural memory. Figure designed by Lyubava Fartushenko (http://lyubava.com)

5.3.2 Self-observation: the transnational birder

While disembarking from the plane when I arrived in Canada, I was immediately impressed by the country's multiculturalism, and excited by the opportunity to see and talk to people from countries

that I had never imagined. For the first time, actually, I felt myself Latin-American, connected with people from other countries with whom I share language, history and, of course, birds. I was also excited to begin to know North American birds. Ontario alone has 470 species to see and discover. However, during the first four months I saw almost no birds.

Before I had the luxury of being concerned about birds, other preoccupations took over. At first, every meal I ordered, I received something different; almost every social interaction generated an awkward moment. It felt like I just "didn't fit in". Besides practical issues, I discovered that the fundamental difference between traveling and moving abroad is that you need to re-invent your life from scratch. Language skills play an important role in the adaptation, and I cannot imagine what other more disadvantaged immigrants go through in their first months. Since then, I learned to respect any foreign accent, as Amy Chua (2011) says, "as a sign of bravery."

I directed my efforts to understanding my own social processes as an immigrant. I joined social activist groups and participated in events organized in the local community, supporting urgent issues of racism, inequality, and indigenous rights, that I discovered are also important in Canada. My new social advocate friends invited me to join a soccer team for which I proposed to have the Red-winged Blackbird (*Agelaius phoeniceus,* Fig 5.) as a symbol. Red-winged Blackbirds are common migratory birds between North and Central America. Particularly, their loudly voiced cries signal the arrival of spring in Eastern Ontario. Its scientific genus name derives from the Greek word, *agelaios*, meaning "gregarious." I played with the United Radicals for two years, and the blackbird was a welcoming symbol of social struggle and solidarity with immigrants and indigenous people. The moto of the team was "Football against racism" (on the back of the t-shirt, Figure 5.4). Without intention, this common bird became my first bird symbol of identity in North America, and comparing my new situation in Canada with previous experiences in Chile, I understood that, this time, the university would not be the place for me to organize and participate. In previous these experiences, the university concentrate the majority of my social world, including activities that fulfilled my expectation and self-realization (i.e., social organizing).

During the first few months, I had little chance to go birding. However, the few opportunities I did have helped me to quickly realize that my style of observing birds was different from local practice. My birding was mostly related to research or work (as described in my previous stories about Sub-Antarctic birds, penguins, etc.), but also deeply and emotionally linked to very good friends (e.g., Sofia the barn owl). I couldn't re-enact this mode of birding in Canada, at least not in the way I used

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to; it took me about two or three years to build a social life around birds. Alas, from the 470 species available, early on, my life was all about Ontario's common urban birds like Blue Jays (*Cyanocitta cristata*), Black-capped chickadees (*Poecile atricapillus*) and crows.

Figure 5.5 Red-winged Blackbird (upper picture, *Agelaius phoeniceus*) and the United Radical Football Club t-shirt design (below). Design by Dann Lynn and MeanScreens design (meanscreen.ca)

I found North American birding much more competitive and goal-oriented than what we call birding in Chile, and there is literature supporting this claim (Sheard 1999; Lee and Scott 2004; Cooper and Smith 2010). For example, the first time I participated in a large birding event with my family (http://friendsofpointpelee.com/festivalofbirds). I struggled to identify many of the birds I saw and keep the pace with the rhythm of North American birding in spring. I felt lost and disappointed in myself. I decided to take action, first by getting out to urban parks on my own to self-train on bird identification and getting good at it. Second, I started to list birds in the field and created my first "life list" using the online platform ebird (www.ebird.org). In Chile, I was always aware of the species I knew yet never kept a tally. Fortunately, my research background helps me with that rigour of field note-taking which later became a very useful social skill that would help unlock the doors of the North American birding community for me.

On local park trails, I met people birdwatching. Other than sharing some small talk, those relationships went no further, despite my efforts. Then, via our network of Chilean graduate students in town, my wife connected with a volunteer English professor to improve her language skills. By chance, my wife's teacher and her husband were birders and we became good friends. They took us to key places to understand bird migration and the rhythm of eastern North American birds. Through them, I also had the opportunity to participate in the famous North American Christmas Bird Count (http://www.audubon.org/conservation/science/christmas-bird-count) along with two local life-long birders. As I read in Kenn Kaufman's book, "Kingbird Highway" (2006), note-taking is the essential labour of the youngest birder in the party. Indeed, my note-taking service was deeply appreciated and I got invited to participate again the next year. *Where were those birders all this time?* I asked myself. The answer is that I was invisible to them, and they were invisible to me before our "gate openers" (my wife's teacher and her husband) connected me and my family to the local birdwatching world. Ethnographers use the broad concept of gatekeepers to denote key actors in the community that have control over the access to resources or information available for the researcher or other members of their own community (Hammersley and Atkinson 2007). I modified this concept to "gate openers" to connote people who are able to open a door for you to enter into a world that was invisible to your eyes (either as community member or as researcher), and make you visible to the eyes of the participants of such a world. Since the Christmas Bird Count event, my social interactions with those birders have become increasingly meaningful, with family trips and more "hardcore[4]" adventures. My comprehension of birds, socially and ecologically, keeps increasing and sharpening.

5.4 Discussion

My stories of birds in Canada, experienced as an immigrant, in many cases, "fit" with findings from the literature treating human mobility (e.g., immigration), place and environment. Social scientists have been recently investigating how immigrants perceive nature differently from long-term residents, especially in Anglophone and European countries (e.g., Johnson et al. 2004; Johnson and Bowker 2005; Buijs et al. 2009). However, I found a common deficiency in most studies setting stereotypes of immigrants by ethnical background with regard to their attempts to compare

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[4] Hardcore is birdwatching lingo referring to a labour intensive bird trip or campaign. Usually, on these trips, birders (in solitude or in teams) try to identify the maximum species possible during predetermined period of time, from 24 hours (Big day) to a year (Big year).

perceptions, motivations, behaviour and values towards nature between long-term residents and newcomers (e.g., Hunter 2000). Of course, as a new immigrant, one's perception differs from someone who has lived longer in a particular place and culture. Instead of focusing on differences between immigrants and non-immigrants, we can learn more by finding points of encounters between people with different backgrounds, thereby increasing social cohesion and integration in already multicultural societies (Gidoomal 2003; Peters et al. 2010). Indeed, my brief account of my story in Canada is textured with the emergence of point of encounters with and departure from my previous experiences in Chile. Searching for those encounters, I see the relationship between people, biodiversity and birds a clear opportunity (Chapter 3).

As we approach the multiple connections between people, place and nature, what we need to better understand are the mechanisms by which biodiversity provides social connections. At the personal level today, most of us are able to directly or indirectly empathize with the experience of moving out, and grieving the absence of friendship and nature, at least relative to how we used to experience them. Academically, more than enough research shows the meaningfulness of social bonding with place and community making (Hernández et al. 2007; Trentelman 2009; Sampson and Goodrich 2009), or the socio-psychological benefits that biodiversity provides to people (Millennium Ecosystem Assessment 2005; Raudsepp-Hearne et al. 2010; Heinsch 2012). However, few studies advocate a deeper exploration of how social interaction intertwines with human-nature interaction. Such research has clarified not only the relevance of socialization in settings such as urban parks (Peters et al. 2010; Peters 2010) and community gardens (Lynch 1993; Gandy 2002; Baker 2005), but also that socialization requires deeper, genuine, social interactions to accomplish its role of promoting social cohesion (clearly what our gate openers did). Although shallow and casual outdoor conversations can signify starting points, for example, they are not enough to truly connect people and provoke the recalibration of place and identity-making processes, in which biodiversity plays and important role (Paper 2 and 3).

Most studies of immigrants and their relationships with nature (and the immigration literature in general) take into account primarily the present moment of people, attributing immigrants' behaviour or previous experiences to their ethnic or cultural belonging (e.g., Teel et al. 2007; Buijs et al. 2009). Instead of focusing in ethnic background, environmental psychologists more empirically conceptualize identity as a set of meanings defining who one is and, by default, how one ought to behave. This construct of identity is intimately linked to place, from which we extract these

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meanings. Place identity, therefore, largely shapes emotional attachments and dependencies with places (for a review, see Kyle et al. 2014). Although immigration and identity-place theory gave me key concepts to frame this research, I found these frameworks unable to entirely accommodate my own experiences. Instead of a static "set of meanings," for example, my identity is a highly active, dynamic and evolving process that changes not only with noticeable place experiences, but also with the exercise of recalling and re-examining past events and memories linked to birds (Figure 5.3). Self-thinking and remembering provide new opportunities to more dynamically explore people's connections with nature and linkages between identity and place, including other living beings as proxies of experiences.

5.4.1 Biocultural Memory

Looking for theoretical connections between memory and biodiversity, late in the research process I encountered the concept of biocultural memory (*memoria biocultural*, Toledo and Barrera-Bassols 2008). This concept builds from the linkage between biological and cultural diversity, and consists in the multiple physical, linguistic and cognitive pathways between us, culture and nature. These connections are provided physically through our genes and our bodies, and cognitively by our language, traditions and practices within the environment. Considering our personal trajectory and history, therefore, biocultural memory is nested and interconnected at three levels: the individual, society, and the human species. These levels, at the same time, reflect different spatial-temporal scales in which we *are* reciprocally what we eat, drink and can signify from our environment─including what we can do, personally and culturally signify, and socially share with or inherit from others. As humans, this memory is what has kept us alive and provokes the process of cultural diversification by expanding our ability to create new cognitive pathways to adapt to new places.

  Toledo and Barrera-Bassols (2008) argue that humans entered a process of increasing biocultural amnesia after the industrial revolution. Characterized by a sharp labour specialization, in this new life-style most individual human decision-making is reduced to a narrow range of detailed and predesigned tasks within a largely closed system (e.g., industrial assembly lines, business models). In such life-systems, connections with the environment and culture are either no longer relevant or unnecessary. The weakening of biocultural connections in part explains processes of language extinction and cultural erosion, which are empirically linked to the decrease of biological diversity and species extinction (Sutherland 2003; Maffi 2005; Carpenter and Bishop 2009). Indeed, among

other traditional communities, indigenous people have been identified as keepers of a functional and active biocultural memory, through linguistic connections with birds (Rozzi 2010) and agroecological traditions intertwined with the ecology of their places (Toledo and Barrera-Bassols 2008).

Although theoretically distant from the frame of this research, biocultural memory helps me to think more holistically about the linkages between identity, place and biodiversity, and picture a bridge between this concept and theories of place identity. The construction of that bridge, however, exceeds the scope of this paper and opens the door to further research. For the time being, this autoethnography and the culturegram- timeline nevertheless provide first-hand evidence that any human, even "a city girl or boy" like me, has unsuspected connections with biodiversity, meaning that birds (but also plants, mountains, rivers) can function as "connectors" to re-enact our biocultural memory (Jorgensen and Stedman 2001; Heil et al. 2007; Head and Atchison 2008).

5.5 Final remarks

When I shared thoughts on biocultural memory with people, I was repeatedly met with the counterargument that we must avoid romanticizing the "myth of the noble savage" (Ellingson 2001). Like comparisons between immigrants and long-term residents, I think that the point is not to claim an environmental moral superiority or inferiority of indigenous and non-indigenous people; rather, the point is to recognize that biological and cultural diversity are deeply interlinked with place and these connections are largely maintained by people with rich ancestral connections to nature. These connections have been largely doubted as 'useful' by colonization processes in favour of progress and development. After all, the very idea of this work started in Robalo Bay after a conversation with an indigenous woman talking about identity, place and nature, and by actively recalling my own connections with places and birds. In this sense, the recognition of a biocultural memory at the different levels (personal, societal and species) is an approach that can reconcile humans with nature in an age of change and mobility.

Upon that conversation in the remote archipelago, I started to observe my own history differently by associating my experiences of place with larger social issues. These issues included the legacy of colonialism in Latin America, imprinted in my personal history (see history of La Cebada), as well as the effect of human mobility with the rural-urban migration of my grandparents and the transnational immigration for graduate school. Rather than feeling detached or placeless, I found that the experience of moving nourished my self-understanding and connections with several places

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throughout my memory. On the move, I started to rebuild my own biocultural memory that neither Spanish conquistadores, industrial revolutionists, nor corporate lawyers were able to erase. In this sense, I found autoethnography an emancipatory tool for people reconciling identity and mobility or reclaiming their biocultural memory neglected by historical processes or political agendas.

To date I have not found anyone who does not have a story about birds. In my own case, recalling and reflecting my own stories with birds in Chile and Canada helped me to better understand my identity as an open, active and dynamic process. In the process of regaining identity and biocultural memory, birds were my companions and points of reference. I conceptualize birds as socioecological connectors in both time and space and proxies of our experiences with place. Autoethnography and the culturegram-timeline can be helpful tools for researcher exploring connections between people, place and nature. In these connections, biocultural memory can be conceived as a cognitive component of place identity.

Chapter 6
Conclusions and final remarks

6.1 Introduction

In this dissertation, the study of human-bird relationships emerged as a useful research resource to explore human mobility as one of the key drivers of socio-ecological change in the Anthropocene. In particular, this study showed how birds, conspicuous constituents of biodiversity, can be proxies of the human experience of place for people on the move. Since transnational immigration has experienced a sharp increase in recent decades, researchers and practitioners from emerging interdisciplinary fields (e.g., Pretty 2011) might find in human-bird relationships concrete units of study to confront sustainability challenges from accelerated social and ecological transformations.

This final section of the dissertation weaves the individual contributions of each manuscript-chapter into the conclusions for the entire work. Each manuscript-chapter explored different aspects of immigrant-bird relationships, and their contributions are grouped now into three categories: i) major findings, ii) theoretical contributions, and iii) recommendations. Major findings are empirical contributions based on data-theory interactions, including the results of the review in Chapter 2. Theoretical contributions are gap-bridging conceptual advances that build upon the literature or tied findings with theory. Finally, recommendations include methodological contributions and practical advice to environmental managers, conservationists and environmental educators. This last set of contributions emerged from both research findings and the experience of the author as an ornithologist and educator. To set the framework for these conclusions, I will start by revisiting the dissertation's purpose and objectives.

6.2 Comprehensive overview of this dissertation's purpose and objectives

In the introductory chapter, Figure 1.2 showed the three nested levels of "change" studied in this research. These levels include (1) the Anthropocene—a human-nature planetary-wide transformation (Ellis et al. 2013); (2) change at the level of ecosystems and societies (Chapter 2); and (3) the impacts of these changes over human-biodiversity relationships at the individual level, which particularly considers human mobility and place as its main dimensions. Connecting these three levels, the purpose of this study was to achieve a better understanding of the interaction between human mobility and biodiversity in the Anthropocene through the study of the role birds play to immigrants'

emotional and psychological adjustments to new surroundings. In this view, ecosystems and societies are considered as units or novel socio-ecosystems.

In greater detail, this dissertation documented meaningful birds and bird-experiences in the past and present lives of immigrants, following a scheme of roots-and-routes, in which roots signified places with strong attachments (e.g., places of origin), and routes symbolized newer connections with the places that immigrants settle (Gustafson 2001; Manzo and Devine-Wright 2014). Under this scheme, I seek to understand, for example, whether people relate to birds in the new place based on previous experiences or they developed completely new relationships based on their new experiences with place and biodiversity. Accordingly, I theorized that birds function as proxies of these immigrants' roots-and-routes, connecting ecological and social drivers of change.

This research is grounded geographically in the Americas, where I investigated the significance of bird species in the sense-of-place for Latin American immigrants to Canada and the United States of America. The American continent is populated by a vast and diverse assemblage of migratory and resident species, including Neotropical, Nearctic and Subantarctic birds. Together with their habitat preferences, migration patterns and behaviour, birds of the Americas have millennium-long significance for a diversity of cultures and societies (Tidemann and Gosler 2010; Ibarra et al. 2012). These species, together with cosmopolitan and introduced species (e.g., European Starling, House Sparrow), comprise the fauna of novel socio-ecosystems in the Americas affected by both ecological and social change (Ellis et al. 2013). In this current context, I detailed how bird meanings and interactions nourish the relationships of Latin Americans with their new place in Canada and the U.S., accomplishing six specific objectives:

1. To illustrate how the study of bird-immigrant relationships conceptually situates the intersection between changing biodiversity and human mobility in ecosystems that in this context should be conceived of as novel socio-ecosystems.

2. To document immigrants' narratives about birds in their relocation experiences, connecting the findings of bird meanings to broader experiences of sense-of-place in the Anthropocene.

3. To identify which specific birds immigrants recall from their roots in Latin America and recognize in their routes to and in Canada and the U.S. This task involved the collection of secondary ornithological data of the species, as well as the interpretation of meanings that participants attribute to them. Secondary ornithological data includes taxonomic and/or

functional classification, migratory status, ecological role and habitat. Human meanings include birds as cultural symbols, life-stage memories and associations between birds and participants' personal experience and trajectory.

4. Using bird ornithological and human meanings to develop qualitative models explaining the mechanisms by which humans associate birds with their places of roots-and-routes. These models are based on information obtained from analyzing a set of ordinary or exceptional circumstances, factors and drivers allowing encounters between immigrants and birds. Drivers are not limited to experiences mediated by birds associated with knowledge (i.e., birds that participants knew), cultural symbolism (i.e., national birds, flagship species), or derived from totally novel experiences with species in participants' routes (e.g., seasonal migration in the Great Lakes).

5. To explore the extent to which the social and ecological changes in lifestyle (e.g., city-rural dwelling, adoption of outdoor activities), livelihood (social interactions, occupation), cultural practices and traditions (e.g., bird-keeping, bird-watching, bird-feeding) influence bird relationships across places and life-stages.

6. Using empirical results and auto-ethnographic experiences to provide recommendations for environmental educators and relevant social actors promoting immigrant integration and social cohesion in multicultural societies.

6.3 Major findings

6.3.1 Novel socio-ecosystems

Worldwide, ecosystems are increasingly novel in structure and function as a consequence of the accumulated impact of human activities and climate change (Crutzen 2002; Ellis 2011; Hobbs et al. 2013; Lewis and Maslin 2015). Chapter 2 advanced the study of novel ecosystems, from a solely ecological perspective, by considering the integration of their social dimensions as novel socio-ecosystems. This proposal brought issues of the conceptualization of human beings in ecosystems in ecology, including expanding their role from merely "drivers of change" in natural systems to "participants in coupled human-nature systems." In this way, novel socio-ecosystems are proposed as new units of study for interactions between humans and biodiversity in the Anthropocene. The utilization of novel socio-ecosystems is illustrated with two case studies: one of invasive species in southern Patagonia (Anderson et al. 2014), and another about the relationship between immigrants

and birds in Northern America (this study). For operability of this conceptual finding, I place it as a major finding between both a theoretical and an empirical contribution.

The argument of novel socio-ecosystems is supported by the fact that societies are also rapidly changing in composition (Jupp 1997; Chryssochoou 2000; Vertovec 2007) by combined pressures of social and ecological drivers (e.g., global labour markets, political conflicts and climate change; see Kelley et al. 2015 for an example). The similarity between change patterns and drivers of ecological and social phenomena indicates, therefore, that societies can be as novel as their ecological counterparts, and that novelty is a social-ecological phenomenon. Although the encounter of new and historic components of ecosystems and societies is not "new" *per se* (Mateos et al. 2013), the speed, rate and extent of their occurrence are unprecedented for this geological epoch (Crutzen 2002) and for human history (King et al. 2010). With the concept of novel socio-ecosystems, I propose the integration of the study of ecological and social novelty as one.

From the perspective of this research, the Anthropocene is characterized not just by human-driven environmental change, but also an unprecedented historical and cultural mixing of human interactions—in the same time-space—with species that evolved in different ecoregions of the planet (Marris 2009). Moreover, this mixing creates a range of situations, for example, in which, on the one hand, indigenous people and long-term residents encounter new plants or animals, either by human introduction (Anderson 2006) or by the effects of climate change on species' ranges (Keith et al. 2009; Stralberg et al. 2009). On the other hand, we can find newcomers encountering "new" plants and animals that differ completely from the biota of the places where they were born and raised (Laird et al. 2011). Considering, moreover, all the situations in between these extremes, the role of human beings interacting with biodiversity only as drivers of change is limiting the possibilities for researchers and managers to understand nature as a co-production (see Chapter 1, Hinchliffe 2007), and confront the Anthropocene in its entire complexity (Steffen et al. 2011; Lorimer 2012; Seidl et al. 2013).

Conversely, extending the role of humans from "drivers" of ecosystem change to "participants" in novel socio-ecosystems allows a) consideration of the personal history in human-nonhuman interaction; b) understanding of the relevance of emotional and psychological connection between people, biodiversity and place; and c) attention to the individual level or human scale in the study of global social and ecological change. This role extension also favours the integration of subtle yet important human dimensions to the study of novelty, including human mobility and sense-of-place,

and its subcomponents of place identity, attachment and dependence (Scannell and Gifford 2010). From a social sciences perspective, this advancement presents an opportunity to integrate biodiversity beyond its opaque conceptualization as 'natural environment,' and to conceive nature as a human-nonhuman co-production (see Chapter 1, Hinchliffe 2007).

6.3.2 Sense-of-place recalibration: Bird social functions in the Anthropocene

The study of immigrants and birds in this research demonstrates that human-nature relationships can be conceived as mobile and novel, and that both humans and nonhumans participate in this novelty. In the current scenario of accelerated human mobility and refugee crises, this unique finding acquires greater relevance as people are more likely to be psychologically and emotionally connected to several places, in a system of roots-and-routes (Chapter 3, Gustafson 2001). These roots-and-routes connections include our social bonds with people, as *in-situ* and *ex-situ* social networks (Gieryn 2000), but also biodiversity bonds with networks of animals and plants that inhabit our places, and have deep cultural or personal significance for us (Chapter 3). These old-new connections are paramount for immigrants' emotional and psychological adjustments to change, considering the continuity of place experience and the integrity of identity for people on the move (Gustafson 2001; Blunt 2007; Manzo and Devine-Wright 2014).

Chapter 3, in particular, examined the role birds play as "points of reference" for Latin American immigrants to Canada and the U.S. In this context, birds helped immigrants to adjust or "recalibrate" their sense-of-place to their new location, by identifying different species of birds in a range of familiarity. This familiarity range includes species that immigrants knew from their roots and completely "new" local or even endemic species from their new homes. Accordingly, by their social functions birds can be classified as accompanying species, key species and new species. Accompanying birds are the exact same species that immigrants can identify in both roots-and-routes. This group includes cosmopolitan species (House Sparrow, Great Egret), migratory species (wood warblers, shorebirds) and species with large geographical ranges inhabiting places in both roots-and-routes (e.g., Turkey Vulture)."New species" is an obvious category, and its members include highly conspicuous, "spectacular" birds such as the Sandhill Crane and the Snowy Owl. Key species signify birds from roots-and-routes in two categories that include birds morphologically similar or taxonomic equivalents (e.g., roots: Cocoi Heron; routes: Great Blue Heron) and ecological equivalents or birds with dissimilar appearance yet very similar behaviour and habitat preferences (e.g., roots: Chimango Caracara, routes: American Crow; roots: tree-runners, routes: nuthatches). A complete list of these

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species can be found in Chapter 3. These bird meanings and social functions are the result of the bird agency that helps immigrants to emotionally and psychologically relocate where they are in time and space.

Immigrants also attributed meanings to birds regarding their personal experiences or cultural background. In this way, birds formed part of their personal history (Chapter 4, 5) and their own identity (Chapter 3). Attributed to accompanying species and key species, bird meanings from the human experience provide people the opportunity for the continuity of their cultural identity between roots-and-routes, and the feeling of self-realization (*sensu* Ryan and Deci 2001) as, for example, birdwatchers or environmental educators. In the new place, birds can also evoke treasured memories with beloved relatives, friends, peers and places. These heartwarming feelings of the continuity, self-realization and memory of birds help immigrants to recalibrate and reconfigure who they are in between their routes and roots. By the meanings of bird agency and human experience, both relocation and identity processes, respectively, comprise a more complex process of place recalibration. In this process, both bird meanings are social-ecological units that provide an understanding of the connection between sense-of-place, mobility and biodiversity in the Anthropocene.

6.3.3 Socialization: the key factor

In both roots-and-routes, I found several environmental and social factors that influenced the process of place-making using birds as reference points. Moving from places, for example, with richer biodiversity, a warmer climate or highly urbanized lifestyle can facilitate, modify or restrict the ways we interact with nature in our new places (Chapter 3). Similarly, other place dependency factors (Kyle et al. 2005), such as transportation or infrastructure, can increase or limit the opportunities to enjoy and connect with birds and place. Although these factors can be especially relevant in early stages of the adaptation to the new place, most of them are highly contextual and circumstantial. However there is one factor whose importance transcends life-stages and places and can take different forms and integrate drivers generating human-nature relationships: socialization. Other factors that responded to broader economic and political issues were categorized as complex because they have multiple positive and negative effects on bird meaningfulness.

Socialization, the act of creating meaningful bonds with people through social activities involving nature, was the most important factor for immigrants maintaining or creating connections with place and nature. Chapter 3 shows, for example, how socialization was the engine of place- and identity-

making processes, in the way that participants narrate meaningful encounters with birds or participate in local bird clubs in their new places (Chapter 3 and 4). These social activities create a feeling of self-realization between past experiences and new connections with people, place and biodiversity. In the new location, internet bird-related social networks provided important media to find others with common interests.

Chapter 4 showed how socialization took different forms and integrates drivers producing meaningful place-biodiversity experiences during participants' childhood, adolescence and adulthood. In childhood, for example, socialization integrates the driver of child play in nature in two modalities that produced different associations between participants and birds: unsupervised and supervised child play. Supervised play in nature included adult-guided outdoor activities (e.g., fishing, scouts), in which participants associated birds with wildlife knowledge. Unsupervised child play involved unstructured activities with cousins, siblings and neighbors exploring participants' unmediated surroundings. In this modality, a large range of situations and variety of birds (i.e., domestic farm birds) symbolized early discoveries and relationships with nature. Adolescence was reported as an obscure period with few or less important relationships with birds, with the exception of teenagers that entered adult social networks related to bird observation, which was facilitated by previous supervised play experiences in nature.

Through socialization, bird relationships during adulthood were strong and long-lasting. In early adulthood, the social organization of clubs, initiatives, and events around birds (and nature in general) created powerful and permanent bonds with peers and friends. In a short period of time (e.g., between the age of 18-22 years), the significance of bird species, places and people emerged alongside volunteering, professional and personal activities by which participants exercise their own agency and even developed deep friendships and sentimental relationships. Subsequently, during late adulthood, birds symbolized family environmental values and means of socialization with children and family members. Parenting, therefore, was the driver that catalyzed relationships between participants, their families and birds.

In all these models of socialization, people exercise their own agency and autonomy enacting meaningful relationship with birds and place. However, another set of economic and political issues signified **complex factors** that considerably affected the social environment of participants. For example, belonging to high income families was positively related to significant relationships with birds, especially in terms of knowledge. On the other hand, a poorer, peasant livelihood was also

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strongly correlated with bird experiences and traditional folklore. Political and military conflicts have also ambiguous effects in the development of bird relationships. In some cases, armed conflicts isolate countries from external influences, generating a detectable national identity in relationships with birds and nature. At the same time, armed conflicts produce a feeling of insecurity, preventing, for example, child play in nature. Finally, social media was a highly influential factor for city dwellers during childhood, such as nature TV shows and documentaries.

6.4 Theoretical contributions

6.4.1 Two sides of the same coin: multinaturality and multiculturalism

With the joint study of ecosystem and societal change, two terms used by social scientists — multiculturalism and multinaturality (Latour 1996; Lorimer 2012)—emerged as conceptual contributions that bridge the gap between social and ecological novelty in the Anthropocene (Chapter 2). Driven by human mobility, the term multiculturalism refers not only to societies comprised by people from multiple ethnic backgrounds, it also refers to the multiple associations between people and the mixing of their cultural worldviews and practices to make sense of a shared physical and political space (i.e., society, Chryssochoou 2000; Gidoomal 2003; Fig. 6.1).

Similar to multiculturalism, multinaturality is a term that we can transfer from its political foundations to ecology to clarify the understanding of novel ecosystems as units containing multiple "natures." Novel ecosystems are constituted by the self-organization of local and introduced species that emerge in heavily impacted lands and differ from their historical counterparts in both composition and function (Hobbs et al. 2013). Some novel ecosystems' species have evolved in different biogeographical regions of the planet. In their arrangements, plants and animals in novel ecosystems are not just passively "there," they interrelate their ecological functions, interact with in-place biogeochemical process and provide habitat for other species (Kanowski et al. 2008; Lugo et al. 2011; King et al. 2011). Importantly, by their spread near urban areas, novel ecosystems may represent the closest connections to nature for the greater than 50% of the planet's human population that today lives in cities (Bridgewater et al. 2011; Yung et al. 2013).

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Figure 6.1 The two sides of the coin of Canadian $1 and $2 coins. In each side, the coins show the representation of culture and animals in the establishment of Canada as a nation/state. The one dollar coin, or "loonie," depicts a classic view of a Common Loon (*Gavia immer*) in a lake. The "toonie," or the two dollars coin, shows a Polar Bear (*Ursus maritimus*) over an ice sheet as a national representative of nature. In both coins, the "human" side is represented by the U.K.'s Queen Elizabeth II, as Canada's head of state, demonstrating a cultural legacy that led to it still being part of the British Common Wealth. The question remains, which symbols of multinaturalism and multiculturalism will Canada exhibit in the future to adjust the representation of human-nature relationships in the Anthropocene? (Photo of the public domain, wikimedia commons).

Creating policies for conviviality (see Chapter 1 and 3) requires reconciliation between humans and nature at multiple levels: overcoming the conceptual separation between human and nature as two different or contested realms (Hinchliffe 2007), accepting and respecting cultural and biological diversity in our places (Gidoomal 2003), and understanding the dynamism, self-organization and adaptation to ecological and social change (Robbins and Moore 2013). To achieve such purposes, multiculturalism and multinaturality can be appreciated as two sides of the same coin, having both human and nonhuman materiality and the ability to coproduce nature (Fig. 6.1; Lorimer 2012).

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6.4.2 Becoming birds, taking roots-and-routes

Chapter 3 used the term "becoming" (Deleuze and Guattari 2004) to weave together the material and symbolic connections between participants and birds in their places of roots-and-routes. This interconnection between physical places, birds and their meanings was illustrated with the process of recalibration of place- and identity-making by Latin American immigrants in Canada and the U.S. The concept of becoming embraces the dynamism that human mobility provides to the idea of sense-of-place and the role of biodiversity in it. We have "become" birds for centuries, depicting such connections with birds in our cultural expressions, from language to myth, from art to medicine and source of food (Emslie 1981; Tidemann and Gosler 2010; Cocker and Tipling 2013). In the Anthropocene, to become a bird for immigrants reflects the indissoluble connection between human sensory experience and the symbolic representation of a world that is highly mobile and interconnected.

Philosophers derive the meaning of "to become" from its archaic Greek form, to be in a process of constant change. In the specific context of this research, birds embodied meanings that interweave bird agency and the human experience in different places. Participants became the birds that they recognized, worked with and signified in their new place as means of self-realization and relocation. However, this embodiment happened in the way that people and animals were there, participating in common places or assemblages. In the process of flight and moving, in and out, from one assemblage to another, we are becoming in a different way than we were previously, extending our connections of identities and affections to people, places and natures in different locations. The recognition of the rhizomatic character of the experiences with nature broadens the range of possible becomings as people and birds encounter each other along "the way" in a hypermobile Anthropocene. To think of identity and human place in nature as a rhizome, extending roots and shoots (or routes), which is how it was conceptualized in this research, facilitates the integration of biodiversity into the lives of immigrants, as iterative and emerging relationships in the Anthropocene. In this way, the concept of becoming challenges syllogisms created by static or sedentary views of place (e.g., place attachment in antagonism with mobility) and biodiversity (assumption of value between "native" and "foreign" species).

6.4.3 Biocultural memory

Participants recurrently mentioned birds as part of their personal memories. These birds evoked places, family and friends from childhood in almost all interviews (Chapter 4). These evocations were

treasured memories weaving events, places and people as relevant units of people's identity (Chapter 5). Looking for theoretical connections between memory and biodiversity, the concept of biocultural memory (*memoria biocultural*, Toledo and Barrera-Bassols 2008) defines the linkage between biological and cultural diversity, as the multiple physical, linguistic and cognitive pathways between us, culture and nature. These connections are provided physically through our genes and our bodies, and cognitively by our language, traditions and practices within the environment. We share these connections with others at different levels, reflecting different spatial-temporal scales: i) the human species level, ii) the societal level, and iii) the individual or personal level of biocultural memory. In the higher, or species scale, our ability to connect with nature is what has kept us alive for millennia; at the societal or group level, particular connections with nature create the process of cultural diversification; and finally for individuals, biocultural memory gives as the chances to modify our identity and to create new cognitive pathways to adapt to new places.

Like geneticists studying proteins as DNA markers to track the evolutionary pathways or development of species, we can use birds as conspicuous representatives of biodiversity to trace our personal biocultural memory and identity with nature (Chapter 5). Accordingly, bird-place-event memories are useful research units to study people's identity with nature, and their interaction within places. Instead of a static set of meanings, memory is the databank of an identity and place-making process that is always evolving and changing, but despite such dynamism, personal biocultural memory is connected with larger links to our ancestral and historic roots. The act of connecting through our personal and collective biocultural memory can be of paramount importance to the process of decolonization and the recovery of peoples' identities and meanings that have been eroded by intentional processes of acculturation. In this way, we do not antagonize mobility with attachment or identity, but instead we integrate our life to the process of reconnecting with the natures and cultures that form part of our places and experiences.

6.5 Recommendations

6.5.1 For researchers

Qualitatively exploring relationships between people and birds, this research contributes two methodological innovations for human-biodiversity studies: the use of mindmaps portraying countries, places, species and their meanings (Chapter 3) and culturegram-timelines following the sequence of events-identities-places and birds as units of people's biocultural memory (Chapter 5).

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Mindmaps were used to visualize the whole set of connections between participants and birds. This visualization allows common meaningful species to be easily found between participants' roots-and-routes. These emerging biogeographical patterns between participants, places and bird species were later incorporated into the research supporting the phenomenological approach of documenting participants' encounters with birds in roots-and-routes. This method innovates by describing a constellation of relationships as roadmaps between multiple trajectories of participants within a geographical range, like in this case the Americas. This method can be easily replicable to other bird-human geographical ranges, considering for example bird-people migratory flyways between Africa-Europe, Australia-East Asia, or even between communities of high and lowland levels in altitudinal range (See Figure 1.2, Chapter 3; Sarmiento 2010).

On the other hand, the culturegram-timelines (Chapter 5) were useful to draw individual identity trajectories connecting units of events-places-birds. In this extension of the use of events organized only in chronological order, we can understand how differently these memory units contribute to the evolving process of identity. Here, this device was helpful to research memories in an autoethnography, however, its use can be extended to ethnography involving participants, and contributing to the study of identity in multicultural societies. The culturegram-timeline used in this research was co-developed with a professional designer, meaning that this device represents also an avenue for collaborative work between social scientists and visual arts professionals. In this way, researchers from multiple fields not only aim to produce science that is contextualized with the Anthropocene, but also to create research that is aesthetically appealing and conceptually sound to engage both the public and other scientists.
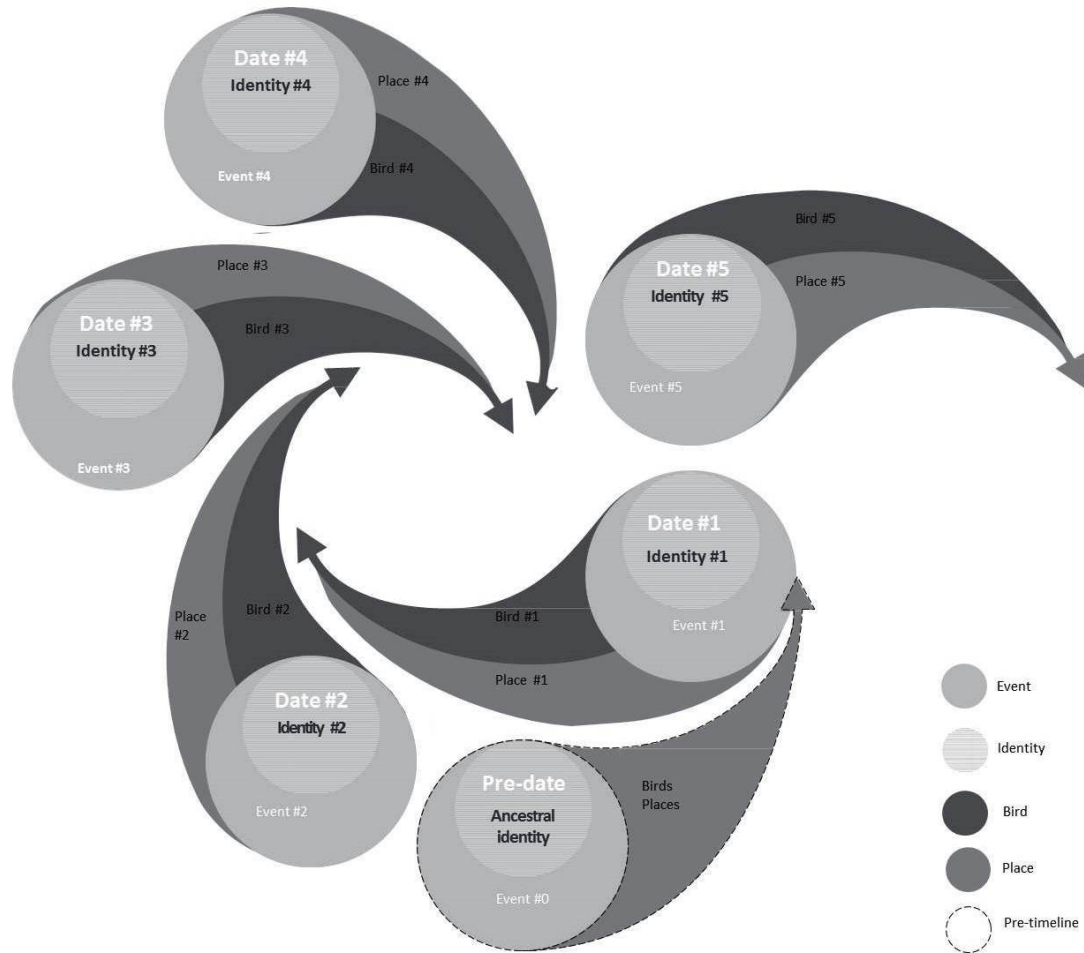
Figure 6.2 Blank culturegram-timeline ready to use for researchers investigating the trajectory of people's identity in relation to place and biodiversity

6.5.2 For decision-makers, environmental managers and educators.

The novel socio-ecosystem concept also challenges the assumptions of human's role in ecosystems from merely perturbation to participants in their process of novelty (Chapter 2). Novel socio-ecosystems are both multinatural and multicultural, implying that there is a set of ecological (nutrient cycling, water management) and social functions (e.g., place recalibration) that these novel species and systems might be performing for people. The recognition of novel socio-ecosystems reveals the necessity to readjust public policies of environmental assessments and public participation (Levine 2005; Bridgewater et al. 2011). This recognition requires a more careful identification of *in-situ* "stakeholders" that may have contested opinions about nature. Instead of emphasizing these differences, though, managers should advocate finding points of encounter and commonalities

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between contested opinions, allowing the possibility for people to make sense of proposed interventions. At the same time, managers should consider this difference to question their own assumptions of ideals or images of nature, and ask if those ideals are taking into account the multiplicity of ecological and social realities. As shown in this research, it should be considered also that the creation of new bonds with biodiversity have deep implications to people's place- and identity-making. Therefore, to build strong communities connected with nature can be more important in the long-run than accomplishing tasks within short-term agendas, procedures and protocols.

Birds as global representatives of biodiversity and provide a solid common ground between people from distant and different places. This idea challenges managers to become not only more cosmopolitan and cross-culturally sensitive and trained (e.g., Clarke and Agyeman 2011), but also be aware of the multiple biogeographical links between local species and flora and fauna from other regions of the world. In this way, this proposal is a win-win scenario, in which environmental programs become truly participative and representative and a larger proportion of people benefit from them, and managers get new skills and training by building capacities to confront the new scenario of change.

6.5.3 Bird-place recalibration for social work and conservation

The same rational that was expressed in the previous recommendations for environmental practitioners may apply for social work. For example, social workers and community organizers working in newcomers' integration programs can work side-by-side with environmental educators and ornithologists. Just as environmental practitioners can be trained to obtain intercultural skills, social workers can be trained to obtain basic skills in local flora and fauna and interact with environmental professionals to help guide immigrants in their adaptation to local biodiversity.

Chapter 3, for example, shows how participants' collective assemblage of 33 accompanying birds and the routes' subset of key species provided strong foundations for immigrants' place recalibration and identity. The vast majority of these species were common birds or even introduced species. This subset perhaps mirrors the novelty of socio-ecosystems that immigrants experience. All these common species are classified by IUCN (2012) in the category of "Least Concern." Consequently, optimizing funding and resources for conservation, ornithologists and researchers pay little attention to them, and the public might also perceive them as pests (Leong 2009). This restriction of

meaningful species by their conservation status might also limit the participation of people that know and engage with these species of least concern.

Accompanying and key species are mostly habitat generalists (e.g., Northern Cardinal, Blue Jay, Red-tailed Hawk). These species normally inhabit a variety of vegetation, especially the forest border. The assemblage of Neotropical migratory birds also contains forest specialists that, by their habitat restriction, are endangered or vulnerable species. In common conservation jargon, these species are known as "birds of the forest interior" (e.g., Hooded Warbler, Scarlet Tanager: Burke *et al.* 2011). Then the question is how environmental educators and conservationist can get newcomers (or people that firmly rely on common species) to connect with habitats and birds of the "forest interior." Here, I use forest interior in a metaphorical sense to signify particular habitats and historical ecosystems that need support and care. In Chapter 3, I propose the use of people's ability to recalibrate their relationship with nature via birds to design outdoor activities with endangered species, explicitly using the attributes and similarities with common species that are meaningful to the broader public. For example, the Northern Cardinal, a border species, has no taxonomic relationship with the Scarlet Tanager; yet, they are both intense red birds that can be used to recalibrate the experience of people to also relate to the forest interior.

The more integrated they felt, the more the participants of this research actively participated in environmental activities and events, and *vice versa* (Chapter 3, 4). This complementarity between socialization and environmental engagement was largely explained by the place and identity recalibration and the idea of becoming, treated in the beginning of this chapter. This finding, beyond its academic contribution, can be used by environmental practitioners to improve newcomers' participation, and, at the same time, by social workers and social integration organizations that foster immigrants integration to their new places (Heinsch 2012). This recommendation is also supported in my own experience in environmental education with birds, which I consider an ideal opportunity for social and ecological sustainability actions.

6.6 Research limitations

At the time of writing up this project, the world suffers one of the most complicated refugee crises of the last decades. This crisis is driven by a combination of external political intervention, armed religious-and-resource conflicts, as a well as disastrous climate events, such as several droughts in the Middle East, north Africa and western North America (Collyer 2005; Piguet et al. 2011; Connolly

2015). For example, during the last month of summer 2015, thousands of people fled into the European Union, seeking asylum from the terrible climatic and war crises in Syria (Kelley et al. 2015). Therefore, the creation and implementation of politics of conviviality, place attachment and identity-making developed in this research can be decisive for fostering multicultural societies. However, the magnitude of physical and psychological effects of forceful displacement on people was inadequately represented in this research, although it offers suggestive insights from the experience of exile, such as during the Pinochet dictatorship in Chile from 1973-1990 or the psychological effects of the decades-long armed conflict in Colombia.

With the exception of micro-aggression or isolated incidents (see Rene and Marquis' quotes in Chapter 4, p. 94), all participants passed through the process of adapting to a new place with dignity. Their previous interest in birds made them also purposefully different from other immigrants. All this is to explain the sensorial mechanism between biodiversity and place. Therefore, the situation of the majority of the participants was "ideal," considering the purpose of the research, but it can be less representative to immigrants living under inhuman conditions and under traumatic processes of immigration and settling. No one should pass through forceful displacement or receive degrading treatment in their new places. To move and adapt to a new place is already a complex process, and in this sense, this research aims to reflect the best of our (feathered) hopes to confront a highly mobile world.

From the methodological side of this research, I argued that birds worked as powerful proxies for human-nature relationships in our age of super-diverse societies and global social-ecological change. I confronted this problem as a truly interdisciplinary challenge combining social sciences and ornithology. I focused the study on immigrants that are birders, naturalists and ornithologists to test this idea and to chart birds' role in human migrants' adaptation to new places. From this innovative approach, I recognize that some limitations emerged in terms of representing human-bird relationships for the immigrant population more generally (e.g., beyond Latin American immigrants). Given the consistency of the findings and depth of the investigation of place-bird-participants bonds through participants' life-stages (before they were interested on birds), however, I expect to find similar although more diffuse patterns in the broader population. In this sense, using the conceptual approach and categories developed in this research, it would be possible to extend the scope of this research to a broader segment of immigrants, including, for example, migrant workers or refugees.

6.7 Final remarks

To observe and to listen to birds requires some degree of tuning with our surroundings. Our ideas of where we belong can be somewhere else, but to watch birds requires us to stop thinking and just to be there—in that place, in that moment. From an unavoidable encounter with an angry Canada Goose, reclaiming its nesting territory, to the dedicated observation of warblers in the North American spring and fall, the vitality of birds offers an opportunity to physically and emotionally connect with nature and place. From my own experience, even if people do not know bird names or refer to domestic species, they still have a story about birds that is also normally linked to family, friends or treasured places. In bird-human relationships, I see the public engage with a common understanding nature, whatever it is and whatever form it takes, blending our own human agency with that of others, reenchanting the world in its transformation.

In this research, the study of the role of birds in sense-of-place for Latin America, immigrants showed the powerful yet subtle, even personal, connection between people and biodiversity in their new places. The four manuscripts of this dissertation contribute to several disciplines of natural sciences, social sciences and the humanities. It promotes extending the role of birds from merely biological "components" of ecosystems to "participants" in human experience, identity and geography. Our relationships with birds as a conspicuous, mobile and concrete representative of biodiversity may contain the key to confronting the confusing scenario of social-ecological changes posed by the Anthropocene.

Appendix A

Three theories of nature as co-production

Nature as co-production can be understood from different philosophical, political or geographical theoretical standpoints. This appendix summarizes three contrasting approaches conceiving nature as a co-production with emphases on inorganic-organic and ecological interactions. These categories also assign different roles to humans in nature, by incorporating different drivers in their formulations.

Nature as assemblages of things-powers

The things-powers assemblage is a philosophical approach to nature that articulates the human-nonhuman relationships by stressing the recognition of the active role of non-human entities-materials-forces, defined as 'things-powers' by the theorist Jane Bennett (2010). Under this lens, the role or agency of humans is beyond their merely cultural meaning or social construction; Bennett decenters the attention from the human ontology towards observing (the agency of) things themselves. All things (including humans) have negative – recalcitrant powers to persist and maintain their form, and have positive-productive powers to make things happen. In this sense, all things are composed of vital materials, and are neither passive object nor intentional subjects; things, including humans, are vibrant matters.

This approach builds its strength in vital materialist philosophy, including ideas from philosophers such as Baruch Spinoza, Manuel De Landa, and scientists like Vladimir Vernadsky. Vernadsky (1945), for example, states that "[m]*ankind, as living matter, is inseparably connected with the material-energetic processes of a specific geological envelope of the Earth—its biosphere. Mankind cannot be physically independent of the biosphere for a single minute*." Spinoza, on the other hand, recognizes this interconnection but postulates that non-human things have also a "conative force", which is an active impulse or tendency to persist in a certain material configuration. The conative force present in all bodies makes all them equal, in their attempt to persist in their own physical configuration, integrating a series of self-organized processes, as simple or as complicated as a stone rolling down a slope or the process of mineralization of bones. This property gives continuity to the relationship between things, and also extends this continuity to humans and their cultural significance

of the non-human world. From this point of view, human beings do not form a separate "imperium" from nature, they integrate and coproduce multiple assemblages of things-powers (Bennet, 2010).

Bennett's conceptualization of nature as an assemblage of things-powers is pure philosophy, in the sense of philosophy as the human capacity of wonder, and to be wondered by simple little facts. She uses empirical examples, such as minerals and metals comprising rocks, blood and machines and contextualizes these examples to appreciate "nature" in larger phenomena such as electric power plants and landfills. These phenomena include not only material arrangements, but human institutions and corporations, their contested discourses and interests. In this way, nature as assemblages of things-powers is not a far-fetched idea that takes rhetorical advantage of a "childhood sense of the world," in which children do not have a clear distinction between living and non-living, materials and forces.

Technonatures

The term technonatures seeks to highlight that diverse social natures are increasingly mediated, produced, enacted, and contested via technology (White & Wilbert, 2009). It strengthens the focus on cities and the emerging urban and peri-urban nature they co-produce. This concept particularly aims to overcome an apparent contradiction about what and where nature is: for example, people may consider themselves to be part of nature yet describe a natural environment as a place without humans (see Vining et al. 2008). How can humans feel part of something which they do not belong to? This contradiction recalls the prevalence of the image of nature as a separate state or colony for holiday in modern Western societies (Hinchliffe, 2007).

The metaphor of technonatures tries to reconcile the idea of nature as a heterogeneous conjoint of technological, ecological, and cultural networks. Similar to assemblages of things-powers, these networks connect diverse hybrid materialities (concrete, wires, organic material, energy) and human and non-human agencies (institutions, ecosystems, ecological relationships) co-enacting technonatural places (White & Wilbert 2009). Instead of being the last option to think of nature, cities are thought as the first places to reconnect humans, their images of nature and the nonhuman world. Technonatures gain particular relevance when we think that for first time in human history more than half of the world population lives in cities (UN, 2014).

More specifically, cities are renamed Living Cities (Hinchliffe and Whatmore 2009) that take care of human and nonhuman urban inhabitants. These nonhumans and human urbanites, moreover, inhabit cities with and against the expert design of urban planners and create novel spaces for

encounters. Living Cities are dynamic places where, for example, urban wildlife groups, amateur naturalists, and voluntary organizations encounter highly visible animals and plants. Both human and nonhuman agents need to functionally exercise their agency, creating spaces and places for conviviality in which the role of humans is to live together amid other humans and nonhumans (Hinchliffe and Whatmore 2009).

The lives of animals and their relationships with humans involve uneven topographies with technonatures of the city, and many species enhance the vitality of cities. Local newspapers, for example, commonly report how animals thrive and vitalize the city. We have Peregrines Falcons (*Falco peregrinus*) or Ospreys (*Pandion haliaethus*) nesting at the top of buildings and communication towers (e.g., The Record 2012). On the other hand, animals are not indifferent to the setups of cities, where, for instance, urban badgers (*Meles meles*), raccoons (*Procyon lotor*), and American crows (*Corvus brachyrhynchos*) behave differently than their rural counterparts (Emery and Clayton 2004). Counterbalancing the cognitive and behavioural approaches towards nonhuman animals, we can admire cities hosting a community of sentient beings that may not just "act out" an internal script limited only by external conditions (Hinchliffe & Whatmore 2009: p.110).

The answer to how we should address human mobility in Technonature is a pending task. Still the concept of conviviality provides already some clues (See chapter 1 and 3). An intercultural interaction between people throughout animal practices is one of those examples. For example, studying the social interaction of different groups of 'pigeon flyers' in New York and Berlin, Colin Jeromlack (2007, 2009) showed how animal practices catalyze ties among men from diverse backgrounds/ethnic origins, resulting in cooperation rather than conflict. For men in Berlin and New York, the pigeon coop becomes a lens for immigrants to interact with other neighbors and fanciers. At the same time, animal practices can balance the necessity of immigrants to maintain ties with their home cultures while generating a source of social life for them in the new home (Jeromlack, 2009).

Transformative co-productions: naturalization and hybridization

Coproducing nature, humans transform their landscapes by different means, by extracting, introducing and translocating of materials and species. Human changes in the landscape generate, at the same time, new conditions for the adaptation of species cultivars and biotypes (Schaefer 2009). Simultaneously, these new landscapes or co-dwelling system (*sensu* Franklin 2002) in which animals and plants form part of the societal cultural heritage and values. Therefore, it is expected that changes in social values will favour processes of landscape change and *vice versa*, including the introduction

of new species and features. Naturalization and hybridization are two ideas of this transformative relationship with nature, in which the adaptation of new components to existing co-dwelling systems can be described as naturalization; and the collide and mixing of two or more co-dwelling systems as hybridization (Franklin 2002; Hinchliffe 2007)

Naturalization is the simple process of the adaptation of introduced species of animal or plant to a new place or ecosystem (Franklin 2002). This process describes the predictable trajectory of humans adapting to a new place, transforming the environment and introducing species. More specifically, naturalization refers to historical events, in which humans settling a new place bring animals and plants from their home places. The documented reasons for these translocations include the satisfaction of specific subsistence needs (e.g., introduction of cattle and crops), economic-recreation needs (trapping and fur farming, Anderson et al., 2006), and even aesthetic reasons to evoke familiar landscapes and soundscapes (Schnitzler et al. 2008; Mirsky 2008; Mynott 2009).

The term "hybrid" refers to the "mixture and reconfiguration" of genes, materials, humans and/or nonhumans. These mixtures can include animals, states, organizations and plants, extensive also to machines and politics, and the collision within and between them (Hinchliffe, 2007). However, the term hybridization is complex. It is used in several fields to illustrate the idea of mixing and it needs to be taken with caution (Mayhew 2012). In biology, for instance, the term hybridization refers to the production of hybrid organisms combining genetically different parents (e.g., mule, a cross between a horse and a donkey). Cultural geographers, on the other hand, use "hybridity," referring the mixture of cultural meanings that emerges when two cultures interact or merge. In the same context, it also may refer to the acculturation process, a sort of 'negotiation' between a mainstream culture incorporating the culture of newcomers (Mitchell 1997). This ambivalent mix of cultural and biological meanings of hybridization is precisely what the concepts in the field of relational geography points to: hybridization happens when biological and cultural identities occurs in a third geographical space, a space in-between, whether, physical or imagined, collective or individual (Soja 1996; Bhabha 2004). In social terms, the distribution of the space of hybridization varies in symmetry. Economic inequality, for instance, shapes the distribution of causal powers or capacity of humans and the way people relate with other people, animals and plants (Hinchliffe and Whatmore 2009).

Differently from naturalization, hybridization stresses that the transformation of human-nature relationships is unpredictable, and rejects the way in which ecological interactionism assumes that

pre-existing forms and outcomes of human relationships with other species (Hinchliffe 2007; Sagoff 2009). However, both processes, naturalization and hybridization, can be seen in the analysis of the history of human-animals relationship, where, for example, European immigrants introduced several species of birds from Europe to the Americas throughout the 19th and 20th centuries. In 1890, for instance, German immigrants introduced several species from Northern Europe, including nightingales, blackcaps, blackbirds, larks, song thrushes, bullfinches, siskins, quails, crossbills. These birds were introduced into the American cities of Portland, Cincinnati, St. Louis, Boston, and New York. The main reasons of the introduction of these species was that the European newcomers missed the birds they had known from their childhood (Kurdylo 2007). In spite of their efforts, most of the introduced European birds did not survive in the new environmental conditions; and yet, some others like the European starling and house sparrow "naturalize" to North America human landscape (Dunn and Alderfer 2011). Today, countries such as Australia, Canada, New Zealand, and The United States have strict regulations introducing foreign species. These multicultural nations comprise people from different origins that "hybridize" their environmental values, adopting (and protecting) local species of flora and fauna as symbols of identities and stop importing animals from their countries of ancestry roots (Franklin 2007).

Appendix B

Bird species tables

Table B.1 Classifications of birds by habitat, migration and conservation status (from Birdlife international, www.ebirds.org)

Attribute		Species	%
Habitat	Generalist	72	49
	Forest	36	25
	Marine shore	8	5
	Grassland	7	5
	Marine	7	5
	Wetland	7	5
	Aquatic & Marine	3	2
	Caves	1	1
	Desert	1	1
	Domestic	1	1
	High Andes	1	1
	Savanna	1	1
	Shrubland	1	1
Migratory behaviour	Resident	79	54
	Full	34	23
	Partially	28	19
	Altitudinal	5	3
Conservation status	Least Concern	100	68
	N/A	22	15
	Near Threatened	12	8
	Vulnerable	6	4
	Endangered	4	3
	Critically Endangered	2	1
Species' history	Local	139	95.2
	Introduced	7	4.8
Total species		146	

Family/Taxa	Species	Family/Taxa	Species	Family/Taxa	Species
Cracidae	9	Tinamidae	2	Procellariidae	1
Psittacidae	9	Troglodytidae	2	Psophiidae	1
Emberizidae	8	Anhingidae	1	Steatornithidae	1
Thraupidae	8	Ardeidae	1	Sulidae	1
Tyrannidae	8	Burhinidae	1	Throchilidae	1
Anatidae	6	Cardinalidae	1	Titonidae	1
Strigidae	6	Cathartidae	1	Todidae	1
Parulidae	5	Charadriiformes	1	Trogonidae	1
Trochilidae	5	Coerebidae	1		
Accipritidae	4	Cotingidae	1		
Falconidae	4	Cuculidae	1		
Icteridae	4	Emberizidae	1		
Scolopacidae	4	Falconiformes	1		
Phoenocteridae	3	Formicariidae	1		
Rhynocryptidae	3	Furnariidae	1		
Sphenicidae	3	Hirundinidae	1		
Turdidae	3	Laridae	1		
Charadridae	2	Momotidae	1		
Columbidae	2	Nyctibiidae	1		
Frigilidae	2	Pandionidae	1		
Mimidae	2	Passeridae	1		
Phalacrocoracidae	2	Passeriformes	1		
Pipridae	2	Pelecanidae	1		
Ramphastidae	2	Phasianidae	1		
Recurvirostridae	2	Picidae	1		
Threskiornithidae	2	Podicipedidae	1		

Table B.2 Birds from the roots, including habitat, migratory behaviour and Conservation status. Bird names indicated as English standard (Latin scientific) / Spanish name reported. Classifications of primary and secondary habitat, migration behaviour and conservation status data were obtained from Birdlife international. However, the information of habitat and migratory behaviour was adapted to the places where participants reported the birds that in some cases varied from the general birdlife dataset. I=introduced, M=mascot or pet.

Family	Roots Bird taxa (Format: English (scientific) / Spanish names)	Habitat 1	Habitat 2	Migration	Conservation
Accipitridae	Black-chested buzzard-eagle (*Geranoaetus melanoleucus*) / Aguila	Grassland	Rocky areas	Resident	LC
	Hawks (*Buteo* spp.) / Buteos	Generalist	Generalist	Partially	LC
	Rufous-tailed hawk (*Buteo ventralis*) / Aguilucho de cola rojiza	Forest	Grassland	Resident	NT
	Variable Hawk (*Geranoaetus polyosoma*) / Aguilucho	Generalist	Grassland	Partially	LC
Anatidae	Ashy-headed Goose (*Cholephaga poliocephala*) / Canquen	Generalist	Grassland	full	LC
	Black-necked Swan (*Cygnus melancoryphus*)/ Cisne de cuello negro	Marine shore	Wetland	Full	LC
	Coscoroba Swan (*Coscoroba coscoroba*) / Cisne coscoroba	Wetland	Wetland	Full	LC
	Domestic Goose (*Anas anas*) /Ganso domestico	Generalist	Wetland	Resident	NA
	Upland Goose (*Chloephaga picta*) / Caiquen	Grassland	Wetland	Partially	LC
	Waterfowl/Ducks (Anatidae) /Patos	Wetland	Wetland	Partially	NA
Anhingidae	Anhinga (*Anhinga anhinga*)	Wetland	Wetland	Resident	LC
Ardeidae	Herons (Ardeidae)	Wetland	Wetland	Partially	LC
Burhinidae	Peruvian thick-knee (*Burhinus superciliaris*) / Huerequeque, Chorlo cabezon	Generalist	Grassland	Resident	LC
Caprimulgidae	Chotacabras (Caprimulgidae)	Generalist	Grassland	Full	NA
Cardinalidae	Blue-black Grosbeak (*Cyanocompsa cyanoides*) / Picoplata	Generalist	Forest	Resident	LC
Cathartidae	Andean Condor (*Vultur gryphus*)/ Condor andino	Desert	Grassland	Altitudinal	NT
Charadriidae	Plovers (Charadridae) / Chorlos	Marine shore	Wetland	Full	NA
	Southern Lapwing (*Vanellus chilensis*) / Queltehue	Generalist	Grassland	Partially	LC
Charadriiformes	Shorebirds (Charadriiformes)	Marine shore	Wetland	Full	NA
Coerebidae	Bananaquit (*Coereba flaveola*) / mielerito (L/I)	Generalist	Forest	Resident	LC
Columbidae	Chilean eared dove (*Zenaida auriculata*) / Tortola	Generalist	Forest	Partially	LC

Family	Roots Bird taxa (Format: English (scientific) / Spanish names)	Habitat 1	Habitat 2	Migration	Conservation
	Feral Pigeon (*Columbia livia*) (I)	Generalist	Generalist	Full	NA
Cotingidae	Screaming Piha (*Lipaugus vociferans*)	Forest	Forest	Resident	LC
Cracidae	Black Curassow (*Crax alector*)	Generalist	Forest	Resident	VU
	Great Curassow (*Crax rubra*)	Generalist	Forest	Resident	VU
	Helmeted Curassow (*Pauxi Pauxi*)	Forest	Forest	Resident	EN
	Curassows (*Crax spp.*)/ Paujiles, pavones	Forest	Forest	Resident	NA
	Guans (*Penelope spp.*) / Pavas	Forest	Forest	Resident	NA
	Cauca Guan (*Penelope perspicax*)	Forest	Forest	Resident	EN
	Salvin's Curassow (*Mitu salvini*)	Forest	Forest	Resident	LC
	Sickle-winged Guan (*Chamaepetes goudotii*)	Generalist	Forest	Resident	LC
	Wattled Guan (*Aburria aburri*)	Forest	Forest	Resident	NT
Cuculidae	Puerto Rican Lesser Cuckoo (*Coccyzus vieilloti*) / Pajaro bobo mayor	Generalist	Forest	Resident	LC
Emberizidae	Common Diuca-finch (*Diuca diuca*)/ Diuca	Generalist	Forest	Partially	LC
	Gorrion americano (*Z. capensis*?)	Generalist	Generalist	Resident	NA
	Grassland Yellow Finch (*Sicalis luteola*) Chirigue	Generalist	Grassland	Partially	LC
	Mouning sierra finch (*Phrygilus fruticeti*) / Yal	Generalist	Shrubland	Partially	LC
	Peruvian sierra finch (*Phrygilus punensis*)	Shrubland	Generalist	Resident	LC
	Large-billed Seed Finch(*Oryzoborus crassirostris*) / Pico Plata Negro	Generalist	Grassland	Resident	LC
	Rufous-collared sparrow (*Zonotrichia capensis*) / Chincol, Pinche	Generalist	Generalist	Partially	LC
	Rufous-naped Brush-Finch (*Atlapetes latinuchus*)	Generalist	Forest	Resident	LC
	Blue-black Grassquit (*Volatinia jacarina*) / Saltapalito	Generalist	Grassland	Partially	LC
Falconidae	American Kestrel (*Falco sparverius*) Cernícalo	Generalist	Grassland	Partially	LC
	Mountain Caracara (*Phalcoboenus megalopterus*) /Carancho cordillerano	High Andes	Grassland	Resident	LC
	Striated Caracara (*Phalcoboenus australis*) / Carancho negro	Grassland	Marine shore	Resident	NT
	White-throated Caracara (*Phalcoboenus albogularis*) / Carancho cordillerano del sur	Forest	Grassland	Resident	LC
Falconiformes	Raptors/Rapaces	Generalist	Generalist	Partially	NA
Formicariidae	Scallop-breasted Antpitta (*Grallaricula loricata*) / Ponchito semiescamado	Forest	Forest	Resident	NT
Frigilidae	Black siskin (*Carduelis atrata*)	Grassland	Rocky areas	Resident	LC

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Family	Roots Bird taxa (Format: English (scientific) / Spanish names)	Habitat 1	Habitat 2	Migration	Conservation
	Black-chinned Siskin (*Carduelis barbata*) / Jilguero	Generalist	Forest	Full	LC
Furnariidae	Des Murs's Wiretail (*Sylviorthorhynchus desmursii*) / Colilarga	Forest	Shrubland	Partially	LC
Hirundinidae	Swallows (Hirundinidae) Golondrinas	Generalist	Wetland	Full	LC
Icteridae	Austral Blackbird (*Cureus cureus*) / Tordo	Generalist	Forest	Partially	LC
	Venezuelan Troupial (*Icterus icterus*) /Turpial Venezolano	Generalist	Forest	Resident	LC
	Long-tailed meadowlark (*Sturnella loyca*) / Loicas	Generalist	Shrubland	Partially	LC
	Oriole Blackbird (*Gymnomystax mexicanus*) / Tordo Maizero	Generalist	Grassland	Resident	LC
Laridae	Gulls (Laridae) / Gaviotas	Generalist	Generalist	Resident	LC
Mimidae	Chilean mockingbird (*Mimus thenca*) / Tenca	Generalist	Shrubland	Resident	LC
	Pearly-eyed Thrasher (*Margarops fuscatus*) / Zorzal Pardo	Generalist	Forest	Resident	LC
Momotidae	Motmot (*Momotus sp.*) / Barranquero, Soledad	Generalist	Forest	Resident	LC
Nyctibiidae	Potoos (*Nyctibius sp.*) / Ayaimama	Generalist	Forest	Full	NA
Pandionidae	Osprey (*Pandion haliaetus*) / Aguila pescadora	Aquatic & Marine	Forest	Full	LC
Parulidae	Blackpoll Warbler (*Setophaga striata*)	Forest	Shrubland	Full	LC
	Cape May Warbler (*Setophaga tigrina*) /Reinita tigre	Generalist	Forest	Full	LC
	Kentucky Warbler (*Geothlypis formosa*) / Reinita de Kentucky	Forest	Forest	Full	LC
	Worm eating warbler (*Helmitheros vermivorum*) /Reinita gusanera	Forest	Forest	Full	LC
	Yellow-throated Warbler (*Setophaga dominica*)	Generalist	Forest	Full	LC
Passeridae	House sparrow (*Passer domesticus*) / Gorrion	Generalist	Generalist	Resident	LC
Passeriformes	Passeriformes / Pajaros	Generalist	Generalist	Resident	NA
Pelecanidae Phalacrocoracidae	Peruvian Pelican (*Pelecanus thagus*) / Pelicano	Marine	Marine shore	Resident	LC
	Guanay Cormorant (*Phalacrocorax bouganvilli*)/ Guanay	Marine	Marine shore	Resident	NT
	Neotropical Cormoran (*Phalacrocorax brasilianus*) / Yeco	Marine shore	Wetland	Resident	LC
Phasianidae	Bantam chicken (*Gallus gallus*) / Gallito de la pasion (domestic)	Domestic	Domestic	Resident	LC
Phoenocteridae	Andean Flamingo (*Phoenicoparrus andinus*) / Flamenco andino	Aquatic & Marine	Salar	full	VU
	Chilean Flamingo (*Phoenicopterus chilensis*) / Flamenco	Marine shore	Wetland	Full	NT
	James's Flamingo (*Phoenicoparrus jamesi*) / Parina chica	Aquatic & Marine	Wetland	Full	NT
Picidae	Magellanic Woodpecker (*Campephilus magellanicus*) / Carpintero Negro	Forest	Forest	Resident	LC

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Family	Roots Bird taxa (Format: English (scientific) / Spanish names)	Habitat 1	Habitat 2	Migration	Conservation
Pipridae	Blue-backed manakin (*Chiroxiphia pareola*)	Forest	Forest	Resident	LC
	Yungas Manakin (*Chiroxiphia boliviana*)	Forest	Forest	Resident	LC
Podicipedidae	Great Grebe (*Podiceps major*)/ Huala	Wetland	Marine shore	Partially	LC
Procellariidae	Peruvian Diving-petrel (*Pelecanoides garnotii*) / Potoyunco	Marine	Marine shore	Full	EN
Psittacidae	Blue-and-yellow Macaw (*Ara ararauna*) / (m)	Forest	Savahana	Resident	LC
	Red-and-green Macaw (*Ara chloropterus*) / (m)	Forest	Savahana	Resident	LC
	Scarlet Macaw (*Ara macao*) (mascot/introduced)	Forest	Forest	Resident	LC
	Austral Parakeet (*Enicognathus ferrugineus*) / Cachaña	Generalist	Forest	Altitudinal	LC
	Puertorican Amazon (*Amazonia vittata*) Cotorra Puerto Rico	Forest	Forest	Resident	CR
	Festive Parrot (*Amazona festiva*)	Forest	Forest	Resident	NT
	Grey-hooded Parakeet (*Psilopsiagon aymara*)	Generalist	Shrubland	Altitudinal	LC
	Psitacids (Psittacidae) / Loros	Forest	Forest	Resident	NA
	White-winged Parakeet (*Brotogeris versicolurus*)	Forest	Forest	Resident	LC
Psophiidae	Grey-winged Trumpeter (*Psophia crepitans*)	Forest	Forest	Resident	NT
Ramphastidae	Red-billed Toucan (*Ramphastos tucanus*) / (I)	Generalist	Forest	Resident	VU
	Tucans (Ramphastidae) / Tucanes	Generalist	Forest	Resident	NA
Recurvirostridae	American Avocet (*Recurvirostra americana*) / Avoceta	Marine shore	Wetland	full	LC
	black-necked stilt (*Himantopus mexicanus*) / Perrito	Marine shore	Wetland	Full	LC
Rhynocryptidae	Black-throated Huet-huet (*Pteroptochos tarnii*)/ Huet huet	Generalist	Forest	Resident	LC
	Chucao Tapaculo (*Scelorchilus rubecula*) / Chucao	Forest	Forest	Resident	LC
	Tapaculos (Rhinocryptidae)	Forest	Forest	Resident	NA
Scolopacidae	Fuegian snipe (*Gallinago stricklandii*) / Becacina grande	Grassland	Wetland	Full	LC
	Greater yellowlegs (*Tringa melanoleuca*) / Pitotoy	Generalist	Wetland	Full	LC
	Sandpipers (*Calidris spp.*) and allies /playeros, playeritos	Marine shore	Wetland	Full	NA
	South American Snipe (*Gallinago paraguaiae*) / Porotera, becacina	Generalist	Wetland	Full	LC
Sphenicidae	Southern Rockhopper Penguin (*Eudyptes chrysocome*) / Pinguino penacho amarillo	Marine	Rocky areas	Full	VU
	Humboldt Penguin (*Spheniscus humboldti*) / Pinguino de Humboldt	Marine	Marine	Partially	VU
	Magellanic Penguin (*Spheniscus magellanicus*) / Pinguino de Magallanes	Marine	Marine	Full	NT

Family	Roots Bird taxa (Format: English (scientific) / Spanish names)	Habitat 1	Habitat 2	Migration	Conservation
Steatornithidae	Oilbird (*Steatornis caripensis*) / Guacharos	Caves	Forest	Resident	LC
Strigidae	Austral Pygmy-Owl (*Glacydium nana*) / chuncho	Generalist	Desert	Partially	LC
	Burrowing owl (*Athene cunicularia*) / Lechuza de los arenales, Pequen	Generalist	Desert	Partially	LC
	Owls (Strigidae) / buhos	Generalist	Generalist	Resident	NA
	Band-bellied Owl (*Pulsatrix melanota*)	Forest	Forest	Resident	LC
	Rouffus leggeg Owl (*Strix rufipes*) / Concon	Forest	Forest	Resident	LC
	Spectacled Owl (*Pulsatrix perspicillata*)	Generalist	Forest	Resident	LC
Sulidae	Peruvian Booby (*Sula variegata*) / Piquero	Marine	Marine	Resident	LC
Thraupidae	Blue gray tanager (*Thraupis episcopus*)/ ver texto	Generalist	Forest	Resident	LC
	Blue-and-black Tanager (*Tangara vassorii*) /	Forest	Forest	Resident	LC
	Euphonias (Euphoninae)	Generalist	Forest	Resident	LC
	Flowerpiercers (*Diglossa spp.*) / Pinchaflores	Generalist	Forest	Resident	LC
	Scarlet-bellied Mountain-tanager (*Anisognathus igniventris*)	Forest	Shrubland	Resident	LC
	Yellow-finch (*Sicalis spp.*)	Grassland	Shrubland	Resident	NA
	Slendered-billed finch (*Xenospingus concolor*) / Pizarrita	Generalist	Shrubland	Resident	NT
	Swallow Tanager (Tersina viridis) / Azulejo Golondrina	Generalist	Forest	Full	LC
Threskiornithidae	Ibis spp. (Threskiornithidae)	Wetland	Marine shore	Full	LC
	Black-faced Ibis (*Theristicus melanopis)*	Wetland	Marine shore	Full	LC
Throchilidae	Andean Hillstar (Oreotrochilus estella)	Forest	Grassland	Resident	LC
Tinamidae	Chilean Tinamou (*Nothroprocta perdicaria*) / Perdiz chilena	Generalist	Grassland	Resident	LC
	Tinamous (Tinamidae) / Perdices	Grassland	Shrubland	Resident	NA
Titonidae	Barn Owl (*Tito alba*) / Lechuza blanca	Generalist	Generalist	Resident	LC
Todidae	Puerto Rican Tody (*Todus mexicanus*) / San Pedrito	Generalist	Forest	Resident	LC
Trochilidae	Black-breasted puffleg (*Eriocnemis nigrivestis*) / Zamarrito pechinegro	Forest	Forest	Resident	CR
	Hummingbirds (Trochilidae) / picaflores, colibries o zumbadores	Generalist	Forest	Resident	NA
	Sword-billed hummingbird (*Ensifera ensifera*) / Colibrí pico espada	Generalist	Forest	Altitudinal	LC
	Sparkling Violet-ear (*Colibri coruscans*)	Generalist	Forest	Altitudinal	LC
Troglodytidae	House Wren (*Troglodites aedon*)/ Chercan	Generalist	Shrubland	Partially	LC

Family	Roots Bird taxa (Format: English (scientific) / Spanish names)	Habitat 1	Habitat 2	Migration	Conservation
	Zapata Wren (*Ferminia cerverai*)	Savanna	Wetland	Resident	EN
Trogonidae	Trogon (*Trogon sp.*) / Trogon	Forest	Forest	Resident	NA
Turdidae	Austral thrush (*Turdus falcklandii*)/ Zorzal	Generalist	Forest	Partially	LC
	Chiguanco thrush (*Turdus chiguanco*)	Generalist	Forest	Partially	LC
	Red-legged Thrush (*Turdus plumbeus*)/ Zorzal de patas colorados	Generalist	Forest	Resident	LC
Tyrannidae	Crested elaenia (*Elaenia albiceps*) / Fio-fio	Generalist	Forest	Full	LC
	Fork-tailed flycatcher (*Tyrannus savana*)/ Cazamoscas tijereta	Generalist	Forest	Full	LC
	Great Kiskadee (*Pitangus sulphuratus*) / ver texto	Generalist	Generalist	Partially	LC
	Patagonian Tyrant (*Colorhamphus parvirostris*) / Viudita	Generalist	Forest	Full	LC
	Thorn-tailed Rayadito (*Aphrastura spinicauda*) / Rayadito	Forest	Shrubland	Resident	LC
	Tufted Tit-Tyrant (*Anairetes parulus*)/ Cachudito	Forest	Shrubland	Partially	LC
	Tyrants (Tyrannidae) / Tiranidos	Generalist	Generalist	Partially	NA
	Vermilion flycatcher (*Pyrocephalus rubinus*) / Pechirojo, pajaro brujo	Generalist	Forest	Partially	LC

Table B.3 Summary of routes birds by family, habitat, migratory behaviour and conservation status. Classifications of habitat, migration and conservation status were obtained from Birdlife international species factsheet (www.ebird.org) updated using Remsen et al. 2014.

Attribute		Species	%
Habitat	Generalist	32	44
	Forest	17	24
	Wetland	7	10
	Aquatic & Marine	6	8
	Grassland	5	7
	Shrubland	2	3
	Grasslands	1	1
	Lake	1	1
	Marine	1	1
Migratory behaviour	Full	29	39
	Resident	25	33
	Partially	18	24
Conservation status	Least Concern	53	74
	N/A	9	13
	Near Threatened	4	6
	Endangered	2	3
	Vulnerable	2	3
	Critically Endangered	1	1
	NT/VU	1	1
History	Local	70	97.2
	Introduced	2	2.8
Total species/taxa		72	

Family/Taxa	Species	Family/Taxa	Species
Paruliade	10	Falconidae	1
Accipritidae	7	Falconiformes	1
Corvidae	6	Fringillidae	1
Strigidae	5	Gaviidae	1
Ardeidae	3	Pandionidae	1
Picidae	3	Passeridae	1
Turdidae	3	Pelicanidae	1
Anatidae	2	Sturnidae	1
Emberizidae	2	Titonidae	1
Gruidae	2	Troglodytidae	1
Icteridae	2		
Mimidae	2		
Paridae	2		
Phasianidae	2		
Scolopacidae	2		
Threskiornithidae	2		
Trochilidae	2		
Alcidae	1		
Anhingidae	1		
Bombycillidae	1		
Cardinidalidae	1		
Ciconiidae	1		

Table B.4 Birds from the roots, including habitat, migratory behaviour and Conservation status. Bird names indicated as English standard (Latin scientific) / Spanish name reported. Classifications of primary and secondary habitat, migration behaviour and conservation status data were obtained from Birdlife international. However, the information of habitat and migratory behaviour was adapted to the places where participants reported the birds that in some cases varied from the general birdlife dataset. I=introduced, M=mascot or pet

Family	Routes - Bird taxa	Habitat 1	Habitat 2	Migration	Conservation
Accipritidae	Bald Eagle (*Haliaeetus leucocephalus*) / Aguila calva	Generalist	Forest	Partially	LC
	Hawks (*Buteo* spp.) / Buteos	Generalist	Generalist	Partially	NA
	Cooper's Hawk (*Accipiter cooperii*)	Generalist	Forest	Full	LC
	Mississippi Kite (*Ictinia mississippiensis*)	Generalist	Forest	Full	LC
	Northern Harrier (*Circus hudsonius*)	Generalist	Grasslands	Full	LC
	Red-tailed Hawk (*Buteo jamaicensis*)	Generalist	Generalist	Resident	LC
	Red-shouldered Hawk (*Buteo lineatus)*	Forest	Generalist	Partially	LC
Alcidae	Marbled Murrelet (*Brachyramphus marmoratus*)	Marine	Forest	Full	EN
Anatidae	Waterfowl/Ducks (Anatidae) /Patos	Wetland	Wetland	Partially	NA
	Swans (*Cygnus* spp.)	Grasslands	Lake	Full	NA
Anhingidae	Anhinga (*Anhinga anhinga*) / Aninga	Wetland	Wetland	Resident	LC
Ardeidae	Herons - Egrets (Ardeidae) / Garzas	Wetland	Marine shore	Partially	NA
	Reddish egret (*Egretta rufescens*)	Aquatic & Marine	Marine shore	Resident	NT
	White egrets (*Ardea alba* and *Egretta thula*)	Wetland	Wetland	Partially	LC
Bombycillidae	Cedar Waxwing (*Bombycilla cedrorum*)	Generalist	Forest	Partially	LC
Cardinidalidae	Northern Cardinal (*Cardinalis cardinalis)*	Generalist	Forest	Resident	LC
Ciconiidae	Wood Stork (*Mycteria americana)*	Aquatic & Marine	Marine shore	Resident	LC
Corvidae	American Crow (*Corvus brachyrhynchos*) / Cuervo	Generalist	Generalist	Resident	LC
	Black-billed Magpie (*Pica hudsonia*)	Generalist	Grasslands	Resident	LC
	Blue Jay (*Cyanocitta cristata*)	Generalist	Forest	Partially	LC
	Fish Crow (*Corvus ossifragus*)	Generalist	Marine shore	Resident	LC

Family	Routes - Bird taxa	Habitat 1	Habitat 2	Migration	Conservation
	Florida Scrub-Jay (*Aphelocoma coerulescens*)	Shrubland	Shrubland	Resident	VU
	Yellow-billed Magpie (*Pica nuttalli*)	Generalist	Forest	Resident	NT
Emberizidae	Painted bunting (*Passerina ciris*)	Shrubland	Forest	Full	NT
	Sparrows (Emberizidae)	Generalist	Generalist	Partially	NA
Falconidae	Peregrine Falcon (Falco peregrinus)	Generalist	Generalist	Full	LC
Falconiformes	Raptors/Rapaces	Generalist	Generalist	Partially	NA
Fringillidae	House Finch (*Carpodacus mexicanus)*	Generalist	Generalist	Resident	LC
Gaviidae	Loons (*Gavia* sp.)	Lake	Marine	Full	LC
Gruidae	Sandhill Crane (*Grus canadensis*)	Grassland	Wetland	Full	LC
Gruidae	Whooping Crane (*Grus americana)*	Grassland	Wetland	Full	EN
Icteridae	Red-winged Blackbird (*Agelaius phoeniceus*)	Wetland	Forest	Full	LC
	Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)	Generalist	Wetlands	Full	LC
Mimidae	Brown Thrasher (*Toxostoma rufum*)	Generalist	Shrubland	Partially	LC
	Northern Mockingbird (*Mimus polyglotus*)	Generalist	Shrubland	Resident	LC
Pandionidae	Osprey (*Pandion haliaetus*)	Aquatic & Marine	Forest	Full	LC
Paridae	Black-capped Chickadee (*Parus atricapillus*)	Generalist	Forest	Resident	LC
	Tufted Titmouse (*Baeolophus bicolor*)	Generalist	Forest	Resident	LC
Paruliade	Bay-breasted Warbler (*Setophaga castanea*)	Forest	Forest	Full	LC
	Black-and-white Warbler (*Mniotilta varia*)	Forest	Shrubland	Full	LC
	Cerulean Warbler (*Setophaga cerulea*) / Reinita cerulea	Forest	Forest	Full	VU
	Common Yellowthroat (*Geothlypis trichas*)	Wetland	Forest	Partially	LC
	Connecticut Warbler (Oporornis agilis)	Forest	Generalist	Full	LC
	Northern Parula (*Parula americana*)	Forest	Forest	Full	LC
	Ovenbird (*Seiurus aurocapilla*)	Forest	Forest	Full	LC
	Wood warblers (Parulidae) / warblers, reinitas	Forest	Generalist	Full	NA
	Yellow-throated Warbler (*Setophaga dominica*)	Generalist	Forest	Full	LC
	Yellow-rumped Warbler (*Dendroica coronata*)	Forest	Forest	Full	LC
Passeridae	House Sparrow (I)	Generalist	Generalist	Resident	LC

Family	Routes - Bird taxa	Habitat 1	Habitat 2	Migration	Conservation
Pelicanidae	American White Pelican (*Pelecanus erythrorhynchos*)	Aquatic & Marine	Wetland	Partially	LC
Phasianidae	Spruce Grouse (*Falcipennis canadensis*)	Forest	Forest	Resident	LC
	Prairie-chicken (*Tympanuchus* sp.)	Forest	Grasslands	Resident	NT/VU
Picidae	Woodpeckers (Picidae)	Forest	Generalist	Resident	NA
	Pileated Woodpecker (*Hylatomus pileatus*)	Forest	Forest	Resident	LC
	Ivory-billed Woodpecker (*Campephilus principalis*)	Forest	Forest	Resident	CR
Scolopacidae	Buff-breasted Sandpiper (*Calidris subruficollis*)	Aquatic & Marine	Grasslands	Full	NT
	Long-billed Curlew (*Numenius americanus*)	Grassland	Marine shore	Full	LC
Strigidae	Barred Owl (*Strix varia*)	Generalist	Forest	Resident	LC
	Northern Hawk-owl (*Surnia ulula*)	Forest	Grasslands	Partially	LC
	Owls (Strigidae) / buhos	Generalist	Generalist	Resident	NA
	Eastern Screech-owl (*Megascops asio*)	Generalist	Forest	Resident	LC
	Snowy Owl (*Bubo scandiacus*)	Grassland	Wetlands	Full	LC
Sturnidae	European (Common) Starling (*Sturnus vulgaris*) (I)	Generalist	Generalist	Partially	LC
Threskiornithidae	Ibis spp. (Threskiornithidae)	Wetland	Marine shore	Full	LC
	Roseate Spoonbill (*Platalea ajaja*)	Aquatic & Marine	Marino shore	Partially	LC
Titonidae	Barn Owl (*Tito alba*) / Lechuza blanca	Generalist	Generalist	Resident	LC
Trochilidae	Anna's Hummingbird (*Calypte anna*)	Generalist	Savanna	Full	LC
	Black-chinned Hummingbird (*Archilochus alexandri*)	Forest	Shrubland	Full	LC
Troglodytidae	Carolina Wren (*Thryothorus ludovicianus*)	Generalist	Forest	Resident	LC
Turdidae	American Robin (*Turdus migratorious*) / Zorzal colorado	Generalist	Forest	Partially	LC
	Eastern Bluebird (*Sialia sialis*)	Grassland	Shrubland	Partially	LC
	Thrushes (Catharus spp.)	Forest	Grasslands	Full	LC

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