



The complex social and legal context of the use of live birds in Mexico

Blanca Roldán-Clarà^{1*}, Claudia Leyva², Ileana Espejel² and Xavier López-Medellín³

ABSTRACT

The use of song and ornamental birds (SOB) as pets is a traditional and commercial activity in Mexico. This paper is part of a larger research which aim was to analyze the commercial use of birds. The objective is to depict the complexity of the stake-holders system involved in the activity of live birds selling in Mexico. We display in diagrams the main stakeholders involved in the activity, highlighting stakeholders acting in several or three spatial scales (micro- or regional, meso- or national, and macro- or global) and the extent of their influence in management. Depicting the complexity in the use of SOB is essential to better understand the decision-making process and improve it in the future.

Keywords: Stakeholders; Songbirds; Wildlife management; Legal framework; Spatial levels; Bird trade.

1 Departamento de Turismo, Universidad Autónoma Occidente, Av del Mar 1200, Tellería, 82100 Mazatlán, Sinaloa; México.

2 Facultad de Ciencias. Universidad Autónoma de Baja California (UABC), Ensenada, Baja California, México.

3 Centro de Investigación en Biodiversidad y Conservación, Universidad Autónoma del Estado de Morelos, Cuernavaca, Morelos, México..

* Corresponding author ✉. E-mail address: BRC (blancamar@gmail.com)

SIGNIFICANCE STATEMENT

The use of song and ornamental birds (SOB) is a traditional and commercial activity in Mexico. We considered its complexity and the social situation of stakeholders for management purposes. Our study aims to analyze the social situation and the legal framework of this activity as a complex system. We display the main stakeholders involved in the activity in diagrams, highlighting stakeholders acting in several or all spatial scales (micro- or regional, meso- or national, and macro- or global) and the extent of their influence in management. The understanding of all components involved in the use of SOB is essential for making an integral diagnosis and for the solution of SOB management problems.

INTRODUCTION

The use of song and ornamental birds (SOB) as pets is a traditional economic activity in many parts of the world (Alves *et al.* 2012; Jepson and Ladle 2005; Nash 1993). The SOB activity consists of capturing live birds and keep them as pets, either because of their beautiful songs and colors or because of their attachment to humans. The activity related to SOB use in Mexico dates to pre-Hispanic time (de Sahagún 1969). Currently, several types of users keep SOB as pets, and government institutions regulate their use. In Mexico, SOB includes many migratory, resident or exotic birds. Passerines such as the northern mockingbird (*Mimus polyglottus*), the northern cardinal (*Cardinalis cardinalis*), the house finch (*Haemorhous mexicanus*), and the slate-colored solitaire (*Myadestes unicolor*) are among the most commonly used birds in Mexico (Johnson *et al.* 2012). Usually, the birds' management does not threaten their long-term persistence (extirpation or extinction), but the incorrect use of SOB put some at risk (Íñigo-Eliás and Enkerlin 2003; Reuter and Mosig 2010). Thus, the government manages (regulates and administers) the commercial activity (Johnson *et al.* 2012).

The management of natural resources requires understanding every actor involved and the scale of incidence and linkages among them (García 2006). For that reason, in this research, we joined two conceptual schemes to assemble the network of actors and spatial scales regarding SOB use as pet-related activities (trading and issuing permits).

The actors' network and their relationships are called complex systems, a model formed by elements and inseparable interactions (Novo 1997). A complex system contains three subsystems: 1) ecological, 2) productive-economic, and 3) social-cultural (Castañares-Maddox 2009). For any decision-making processes, it is advantageous to understand the spatial complexity of the system. Also, the solutions have to be multiscale, meaning the consideration of local actors (regional or microscale), national actors, or sectors (mesoscale) and, if there are relationships among international actors or institutions, then macro or global scale (Novo 1997).

Methodologically, the complexity begins with subdivided subsystems. For instance, the ecological subsystem subdivided into the natural resource under management and the ecosystems where the natural resource inhabits (Dajoz 2002). The productive-economic subsystem defined by the market for the resource, supply, and demand (Parkin 2001) and the social-cultural subsystem contains three elements that together define the social situation (Spradley 1980), meaning place or location, stakeholders, and activities. According to Spradley (1979, 1980), the social

situation relates to the place (any physical environment) where stakeholders are carrying out specific activities. A stakeholder is any individual belonging to a group, organization, entity, corporation, or institution from the governmental, social, or private sectors or non-governmental organizations or international agencies. The activities have an aim, a goal, and they directed at some particular issue. The activities are the stakeholder responsibilities in the context of the focal issue (in this case, SOB related issues) and can be the responsibility of one or several stakeholders (Spradley 1980).

Furthermore, as our interest is to ease the decision-making process of SOB trading, it was important that the social situation diagram embedded in the complex system needed to be crosscut by the legal framework regulating both activities and relationships among stakeholders (Brañes 2000).

Due to the number of stakeholders, activities, places, and regulations forming part of the SOB use activity, and because of the incomplete information existing about it, it was necessary to compile the available information from a broad perspective to obtain a comprehensive view of the activity. Organizing all the stakeholders, activities, places, and regulations inclusively, as Spradley (1980) and Novo (1997) suggest, helps to understand the context of bird trade and analyzing the involved stakeholders. The organization as a complex system allowed us to take all stakeholders into account when making decisions about managing natural resources and managing conflicts of interest—achieving environmental governance possible. It also allowed us to assume that the more actors and more relationships, the more difficult a decision is. Thus, this research article aims to understand SOB trading in Mexico by representing a complex system of actors, activities, places, and spatial relationships.

MATERIAL AND METHODS

This paper is part of a larger research analyzing the SOB use in Mexico (Roldán-Clarà *et al.* 2014; Roldán-Clarà *et al.* 2017a, 2017b). This time we used the combination of theoretical frameworks of Maddox (2009), Novo (1997) and Spradley (1980) to build diagrams of the social situation of song and ornamental birds use activity in Mexico organized in three spatial levels as a complex system (Figure 1). The purpose was to depict such systems for future improvements in Mexico and elsewhere.

For the identification of the stakeholders, we reviewed the literature that was used for the elaboration of the manuscript entitle: Literature review of the use of birds as pets in Latin-America, with a detailed perspective on Mexico (Roldán-Clarà *et al.* 2014). We considered that the documents included in that

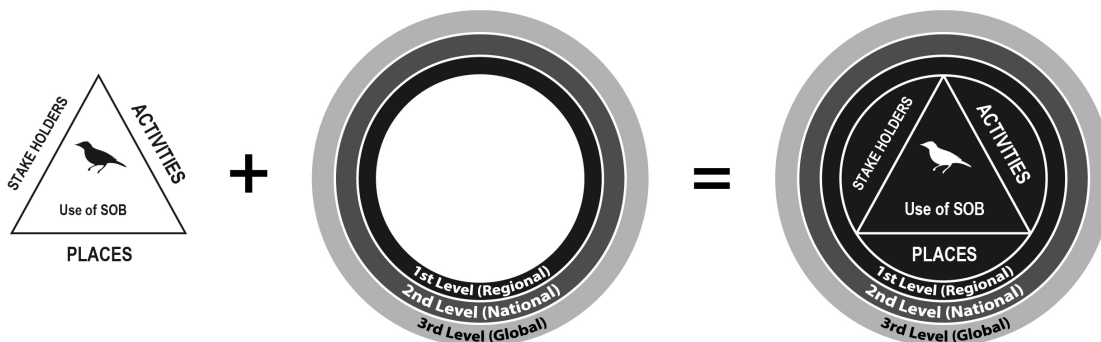


Figure 1. Diagram of the social situation of song and ornamental birds use activity in Mexico organized in three spatial levels as a complex system, according to Maddox (2009), Novo (1997), and the Spradley (1980) social situation. The combination of figures is useful for decision-makers.

manuscript contains all the actors related with this activity. At the same time, we reviewed the legislative documents on the House of Representatives (2020).

We followed the methodologies described by Reed *et al.* (2009) to identify and describe all the stakeholders involved in SOB use in Mexico. The first author of this paper carried out ethnographic immersion with several stakeholders (Taylor and Bogdan 1984) during a field trip from May to July 2013 and conducted semi-structured interviews with stakeholders from the governmental (Roldán-Clarà *et al.* 2017a) and commercial sectors (Roldán-Clarà *et al.* 2017b), and non-governmental organizations (NGOs) in rural and urban areas from central Mexico. The first author visited well-known places where birds are captured and sold, and homes of bird catchers (in Mexico called *pajareros*) at eight Mexican states (San Luis Potosí, Jalisco, Puebla, Veracruz, Guanajuato, Hidalgo, State of Mexico, and Mexico City). As well, she did direct observation (Albuquerque *et al.* 2012) in governmental offices. At all times, in a field log, she described places and stakeholders' activities as recommended by Spradley (1980). The social situation at different spatial levels (micro- or regional scale, meso- or national scale, and macro- or global scale) to identify stakeholders and types of stakeholders, as well as places and activities, was defined using the classification system of Monti and Escofet (2008) which was recently depicted with an example of a marine species by Cruz-Colin *et al.* (2021). We build diagrams of the social situation describing the stakeholders and their interrelationships for each of the three spatial levels. For validating the information, two experts in the use of wildlife reviewed the diagrams, and in July of 2015, we presented the final results to groups from the commercial, governmental and social sectors related to the use of song and ornamental birds.

RESULTS

In figure 2, we present the complex system centered on the social system of SOB commercial activities in Mexico. For the complex system construction, we identified that the three scales are present; therefore, we draw three circles. We decomposed the social system as a network of actors, activities, and places depicted by the spatial scale of action in the center.

The social system is composed of 24 stakeholders representing six sectors (including one mixed governmental - non-governmental sector) (Table 1).

To understand the complexity of the social system related to SOB trading in Mexico, we identified each stakeholder, defined each one by providing details on their composition, how they relate to other stakeholders, and roughly described their activities. There are six sectors related to SOB trading:

1. Commercial/resource users

The main scheme for wildlife use in Mexico (Robles de Benito 2010) is known as Management Units for the Conservation of Wildlife (UMAs by its Spanish acronym) (DOF 2006), according to the Program for Wildlife Conservation and Productive Diversification in the Rural Sector (SEMARNAP 1997). The General Law of Wildlife (LGVS by its Spanish acronym (López-Medellín and Íñigo-Eliás 2009)) defines UMAs as "the properties and facilities registered and operating by an approved management plan and within which permanent follow-up is given to the status of habitat and populations or specimens there distributed." UMAs are considered a protected land and/or good requiring their use and authorization by the General Wildlife Office (DGVS for its Spanish acronym). There are two types of UMAs, extensive and intensive: in the first ones, animals live free inside the UMA lim-

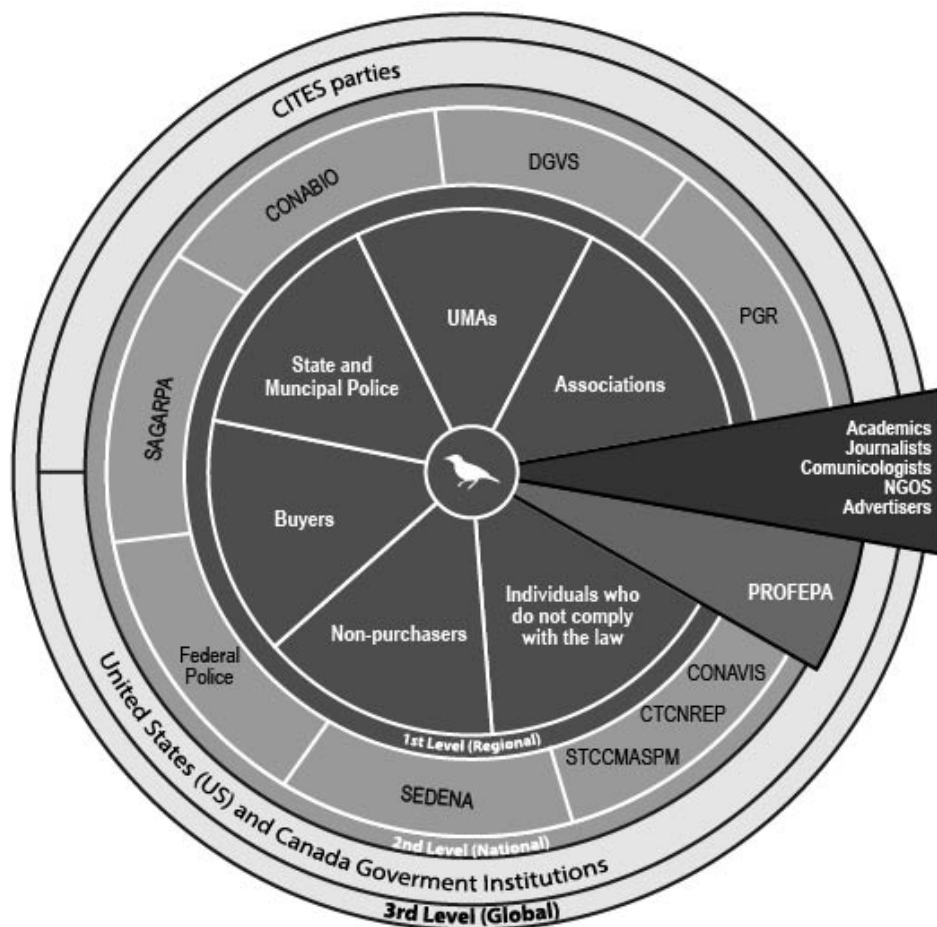


Figure 2. Diagram of stakeholders according to spatial level. See Table 1 for abbreviations. Source: Own elaboration based on Castañares-Maddox (2009).

its; and in the second specimens are confined. There are two types of stakeholders at UMAs:

- i. **UMAs land-owners** (DOF 2006) possess the land and the wildlife existing within their land and,
- ii. **Independent technicians working at the UMAs** whose main job is to elaborate official reports regarding the fauna population size and status. The proprietors of the UMAs are obliged to file such reports.

The *pajareros* are mainly rural people that have existed in Mexico for at least four decades (Grohmann 1997). They are well-organized in associations focused on the use of SOB only for subsistence purposes. Associations and their members are not land-owners but obtain capture permits from the government grant for each species and population size annual state. The two most important associations are Civil Association of Song and Ornamental Bird Retail-

ers (in Spanish known as Comercializadores de aves canoras y de ornato. Asociación Civil), and National Front of Producers, Catchers, Transporters, Exporters, and Importers of Song and Ornamental Birds (In Spanish Frente Nacional de Productores, Capturadores, Transportadores, Exportadores e Importadores De Aves Canoras y de Ornato).

- I. Birdcatcher.** The official register of bird catchers in Mexico includes 570 members (Official database from DGVS 2016) and nearly 4,000 *pajareros* throughout the country, who carry out this activity as an alternative source of income. The *pajareros* capture birds seasonally, but they carry out sales year-round.
- II. Bird keepers** usually are household members (mainly women) who feed and care for them at their homes.
- III. Bird carriers** are intermediaries who buy the birds from the catchers for transport-

Table 1. Sectors and stakeholders involved in the use of song and ornamental birds in Mexico

Sectors	Stakeholders	Types
Commercial/resource users	Management Units for the Conservation of Wildlife (UMAs by its Spanish acronym)	Owners of UMAs Technicians of UMAs
	The National Association of Breeders, Catchers, Carriers and Dealers of Song and Ornamental Birds C. A. (Associations)	Leaders, Bird catchers, Bird keepers, Carriers and Sellers
	Permit holders and individuals who do not comply with the law	Buyers
Governmental	The General Wildlife Office (DGVS by its Spanish acronym)	
	The National Commission for the Knowledge and Use of Biodiversity (CONABIO by its Spanish acronym)	
	The Federal Attorney for Environmental Protection (PROFEPA by its Spanish acronym)	
	Office of the General Prosecutor (PGR by its Spanish acronym)	
	State and Municipal Preventive Police (PP by their Spanish acronym) and Federal Highway Patrol (PF by its Spanish acronym)	
	Mexican Armed Forces, part of the Ministry of National Defense (SEDENA by its Spanish acronym)	
	Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA by its Spanish acronym)	
	US Fish and Wildlife Service (USFWS) Canada’s Department of the Environment	
	Countries of The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	
Academic	National Institutions	Foreign Institutions
Communication	Journalists, communication specialists, advertisers, and publicists	
Social	Non-governmental organizations (NGOs)	Conservationists Animal protection societies.
	General public	Non-purchasers
Mixed	National Technical Advisory Council for the Conservation and Sustainable Use of Wildlife (CONAVIS by its Spanish acronym)	
	National Technical Advisory Committee for the Recovery of Priority Species (CTCNREP by its Spanish acronym)	
	Technical Advisory Subcommittee for the Conservation, Management and Sustainable Utilization of Parrots in Mexico (STCCMASPM in its Spanish acronym)	

ing them to other locations or warehouses. Carriers can also be members of the pajareros associations and bird catchers.

IV. Bird sellers buy birds from bird catchers or carriers to trade birds in streets, markets, veterinary clinics, pet stores, aviaries, and in cultural or religious events. Some bird sellers are members of the pajareros associations and could also be bird catchers. We identified some illegal issues. For obvious reasons, this group of stakeholders was challenging to identify, but we found sellers in the bird market lacking an SOB use permit or did not comply with the environmental regulations during the

fieldwork. Some pajareros (including bird catchers, keepers, carriers, and sellers) did not obtain capture permits or have expired permits. Even more, some pajareros had permits but exceeded the authorized capture quota or had captured species prohibited by the DGVS.

V. Bird buyers acquire birds as pets or for ornamental purposes.

VI. Association leaders representing each of the associations, and which are relevant stakeholders because they generally act as interlocutors between association members and the DGVS, manage permissions, and frequently have negotiation power.

2. Government sector

Among the governmental actors we identified:

- a) **DGVS**, responsible for granting capture permits to UMAs, and subsistence use permits to registered associations.
- b) **CONABIO** acts as a link between society and the academic and governmental sectors, having the mission of promoting, coordinating, supporting, and carrying out activities aimed at knowledge, conservation, and sustainable use of biological diversity for the benefit of society. Specifically, regarding SOB, CONABIO carries out population studies of bird species and, based on such studies, gives recommendations and information to governmental officers for decision-making purposes.
Several governmental bodies have the task of inspecting and monitoring compliance with the laws, including:
 - c) The **Federal Attorney for Environmental Protection** (PROFEPA, by its Spanish acronym), monitor, and enforce environmental laws and corresponding standards;
 - d) The **Office of the General Prosecutor** (PGR, by its Spanish acronym) is responsible for investigating and prosecuting federal order crimes;
 - e) **State and Municipal Preventive Police**;
 - f) **Federal Highway Patrol**;
 - g) **Mexican Armed Forces** part of the SEDENA; and
 - h) **SAGARPA** in charge of Checkpoints and Phytosanitary inspections.

Because Mexico, the United States of America (USA), and Canada are part of the North American Bird Conservation Initiative (NABCI) and the Trilateral Committee for Wildlife and Ecosystem Conservation and Management, we include these countries in the governmental sector. The NABCI is an agreement between non-governmental organizations, academic institutions, and governmental agencies of Canada, Mexico, and USA to facilitate and promote through partnerships the conservation of all native birds of North America and their habitats. As several migratory SOB reach Mexico from the USA, we included:

- i) **U.S. Fish and Wildlife Service** (US-FWS), an agency depending on the Interior Department dedicated to the management, conservation, and preservation of wildlife, which among its national programs, includes the Migratory Bird Program.

3. Academic sector

We included national and foreign institutions providing scientific information.

4. Communications sector

Such as journalists, publicists, and communication scientists: stakeholders whose role is transmitting the information.

5. Social sector

We identified national and foreign non-governmental organizations (NGOs) as stakeholders in SOB use, together with the general public, non-purchasers in particular, which do not buy SOB for various reasons.

Three Mexican NGOs dedicated to working on conservation and whose role is to protect certain natural areas for conserving natural resources are most important regarding SOB (Grohmann 1997): TRAFFIC, Defenders of Wildlife, and Teyeliz. TRAFFIC, which disappeared in 2015 due to lack of budget, helped to strengthen the authorities' capacity to monitor compliance with applicable laws, offering tools and training modules. Defenders of Wildlife and Teyeliz disseminate campaigns –mainly addressed to children– for discouraging the public from buying SOB (particularly parrots) and promote bird watching as an alternative source of income for bird catchers. At the global level, Partners in Flight is another relevant NGO that –as Defenders of Wildlife C.A. and Teyeliz– promotes (among many other actions of conservation) bird watching as an economic activity alternative to capture (Cornell University 2020).

Among the NGOs, some animal protection societies have the function of ensuring animal welfare (Duffy and Moore 2011), mainly focusing on companion animals. Among such international NGOs, Avian Welfare Coalition deserves highlights regarding SOB use because it has the mission to “raise awareness about the plight of parrots and other captive birds” (The Avian Welfare Coalition 2020).

6. Mixed sector

We included three federal-level institutions considered as mixed stakeholders because they work together with various social stakeholders such as

NGOs, private and academic institutions, and producers.

- i. **CONAVIS**, a technical advisory council, whose purpose is achieving participation of expert civil society members in conservation, protection and sustainable use of wildlife (SEMARNAT 2013) by issuing professional opinions and recommendations for species and populations at risk, as well as establishing priority species and populations; opinions on which the DGVS depends for decision-making (DOF 2000).
- ii. **CTCNREP** advisory council, established in 1999 (Cariño and Zariñán 2008), for determining priority species for conservation administered by the National Commission on Natural Protected Area (CONANP by its Spanish acronym), which is relevant for this study because several priority birds are psittacids (true parrots) (DOF 2014).
- iii. **STCCMASPM** subcommittee, which has several objectives regarding the conservation and utilization of parrots: collaborating and unifying efforts with the government and other bodies and persons with the same interest; bringing together persons with knowledge of parrots; developing, proposing and promoting a National Strategy; proposing policies and advising responsible authorities; gathering relevant information; contributing to the awareness of parrots among the general population; organizing and participating in activities, and promoting and supporting scientific research (SEMARNAP-INE 2000).

Finally, figures 3 to 5 show the social situation at each of the spatial scales, in which the complexity of SOB use can be graphically seen and give examples of stakeholders, places, and activities related to SOB use in Mexico. Examples of places are the cloud forests in the states of Puebla and Veracruz where bird catchers capture the slate-colored solitaire; the *Basílica de Santa María de Guadalupe* where every Palm Sunday the *pajareros* have their birds blessed and give thanks to the Virgin of Guadalupe for their work; the offices of the DGVS where its officials review applications, grant use permits, and conduct meetings with users; the roadblocks where the SAGARPA, the PROFEPA, the Police, and the Mexican Armed Forces inspect vehicles and goods; the governmental offices where, for example, the National Workshop on international wildlife trade took place in October 2009 in Mexico City with the participation

of PROFEPA, TRAFFIC, the Department for Environment Food and Rural Affairs (DEFRA), and the British Embassy in Mexico; and the governmental offices of CITES member countries where meetings of the CITES Conference of the Parties held.

By quantifying the number of stakeholders in each spatial level, we found the highest number of stakeholders occurs at the national level (Spradley 1979), followed by the regional (Parkin 2001), and the global (Reuter and Mosig 2010) levels. However, this is not the case with the number of places and activities. At the regional level, we found the highest number of places and activities related to SOB use, which is due to resource users being located at the regional scale value and use SOB in many ways. Besides, many of the actions currently carried out occur locally. To strengthen the analysis of the social situation, we integrated the legal framework, since stakeholders use it to manage SOB use, take actions, and make decisions. Also, because the highest number of stakeholders in the social situation that we studied belong to the governmental sector, we decided to carry out a full description of the legal framework governing these stakeholders and verify which stakeholders are governed by what kind of regulation, and which is their action range (spatial scale) (Table 2).

The legal framework's spatial level can be assigned based on its function being either co-operative, regulatory, or administrative (Table 2). The cooperative function occurs at the global level, but the regulatory and administrative functions occur at the national level. In the case of SOB, there is no relevant legal framework at the regional level. Legal frameworks to ensure cooperation on SOB use include the Convention for the Protection of Migratory Birds and Game Mammals, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Convention on Biological Diversity (CBD). The Convention for the Protection of Migratory Birds and Game Mammals –signed between the governments of Mexico and USA– has the objective of conserving biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising from the utilization of genetic resources, addressing general measures for conservation and sustainable use of components of the biological diversity (Articles 6 and 10). CITES – an international agreement aiming at ensuring that international trade in specimens

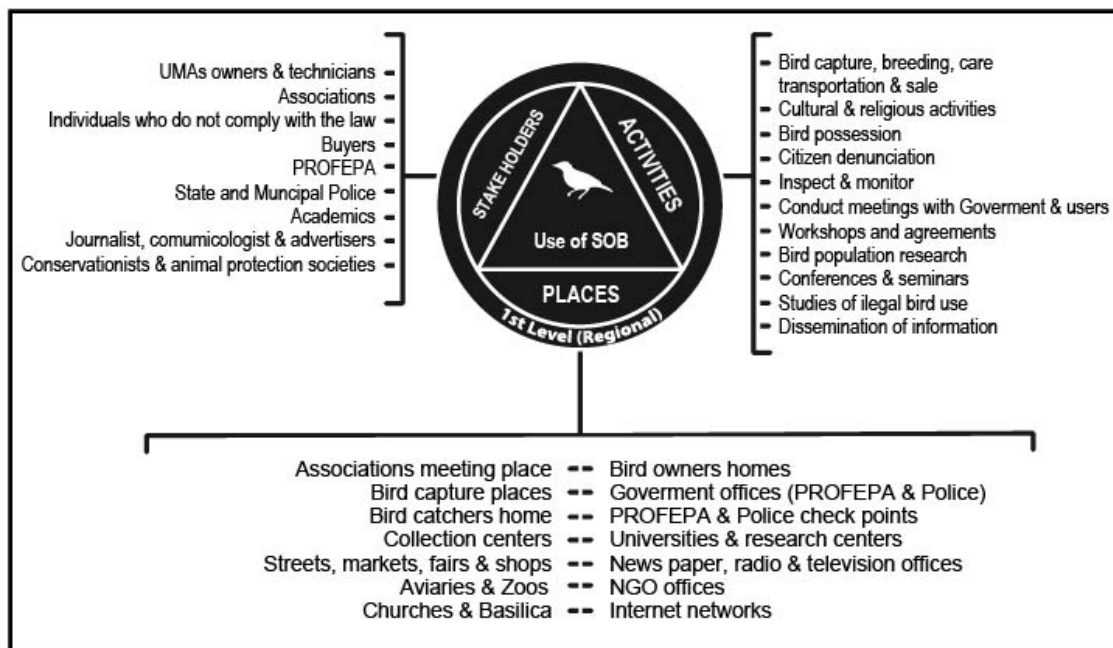


Figure 3. Diagram of the social situation of the use of song and ornamental birds in Mexico at the micro spatial level (regional scale). See Table 1 for abbreviations. Source: Own elaboration.

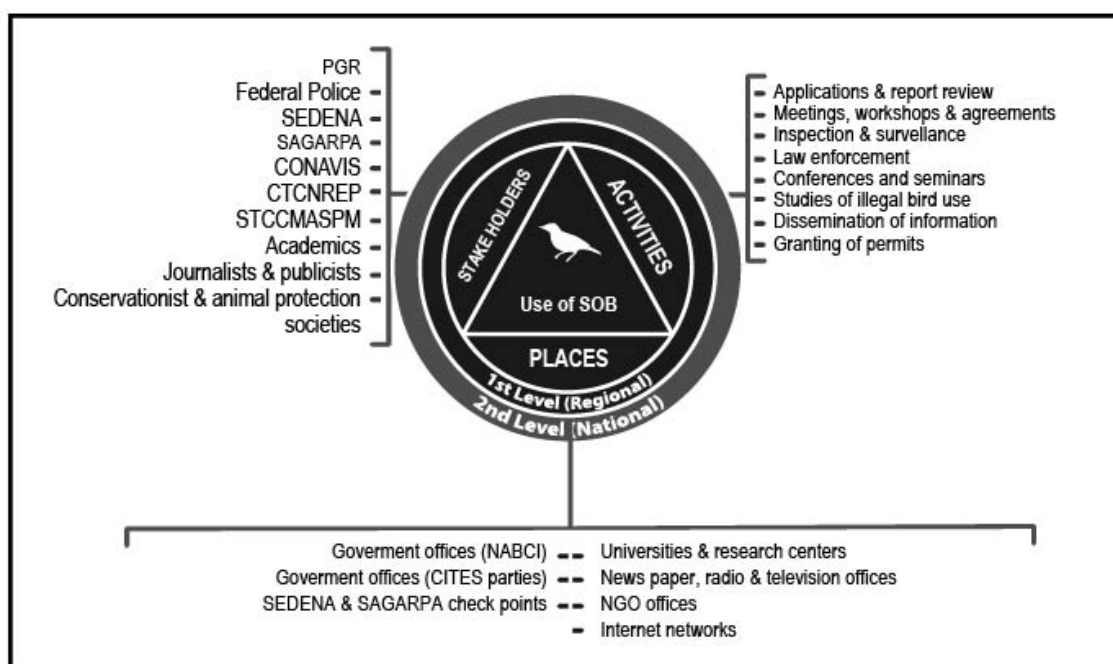


Figure 4. Diagram of the social situation of the use of song and ornamental birds in Mexico at the meso spatial level (national scale). See Table 1 for abbreviations. Source: Own elaboration.

of wild animals and plants does not constitute a threat to their survival (CITES 2014)– regulates the export and import of SOB. The CBD’s objective –an international convention formed by the initiative of the UN– is protecting migratory birds through appropriate procedures. It

applies to SOB since certain migratory species, such as the lazuli bunting (*Passerina amoena*) or the blue grosbeak (*P. caerulea*) are captured. Some of the Mexican codes, laws, regulations and standards regulating SOB use include: Chapter II of the Federal Civil Code “The

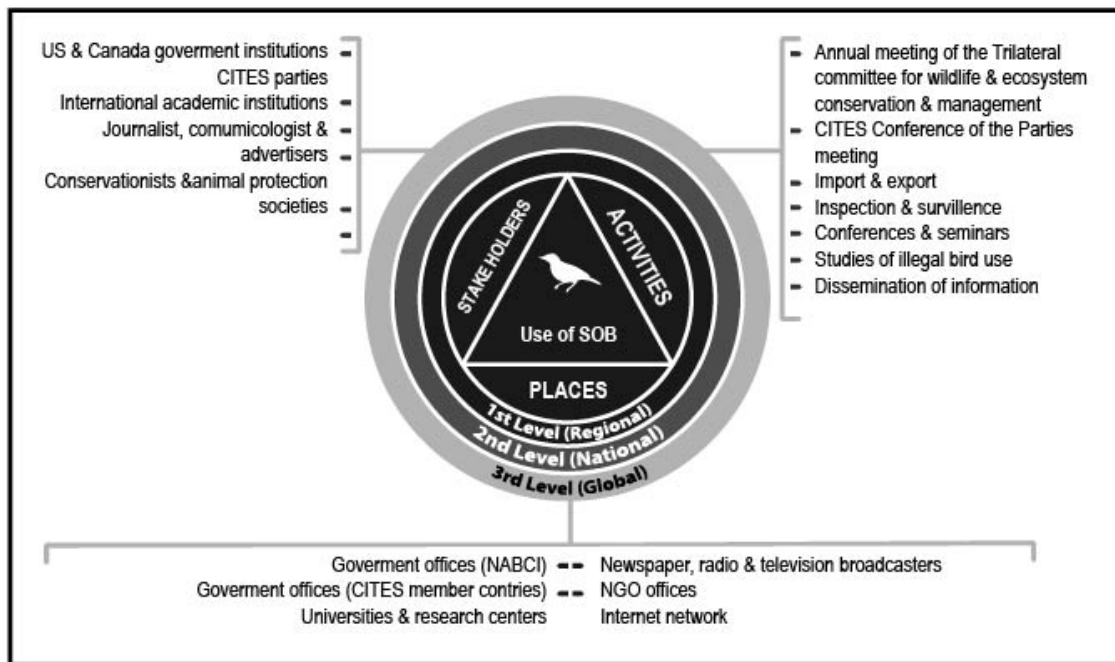


Figure 5. Diagram of the social situation of the use of song and ornamental birds in Mexico at the macro spatial level (global scale). NABCI: *North American Bird Conservation Initiative*. See Table 1 for abbreviations. Source: Own elaboration.

ownership of animals" stating that the owners of private property are also the owners of the animals living there, and that the right to hunt is governed by administrative regulations; the LEGEEPA, which among other things addresses environmental protection on national territory, contains provisions applying to SOB in its Chapter II devoted to flora and fauna; the LGVS –which aims at determining the relative competence/jurisdiction of the Federal, State and Municipal governments regarding conservation and sustainable use of wildlife, and their habitat, and for the first time introduced the term “use for subsistence purposes”– contains standard provisions for the conservation and sustainable use of wildlife (Title V: Chapter VIII, UMAs System; Chapter X, Legal Provenance; Title VII: Chapter I, extractive use; and Chapter II, use for subsistence purposes), as do its implementing Regulation (Title Third: Chapter V, legal provenance; Title Fifth: Chapter First, extractive use; and Chapter Second, use for subsistence purposes). The Internal Regulation of the SEMARNAT sets out the Ministry’s authority and mentions that the DGVS will have the power, among other things, to propose, promote and authorize the establishment of UMAs (Article 31, Section IX). The Official Mexican standard NOM-059-SEMARNAT-2010

lists threatened species or populations of wild flora and fauna. Therefore, the capture of birds contained in these listings is further restricted.

Finally, plans, programs, manuals and agreements are additional legal frameworks administering SOB use in Mexico including the National Development Plan, which had a highly significant role in SOB use policy because its Axis 4 (Environmental Sustainability) attempts to restrain the deterioration of rainforests and other forests by promoting and encouraging UMAs; the Sectorial Program for the Environment having the same strategy as the National Development Plan; the SOB Type Management Plan aiming at standardizing the development of UMAs’ activities for conservation, management, and sustainable use of SOB, thereby facilitating the supervision of the resource by UMAs’ technicians; and the Procedure Manual for Authorizations, Permits, Registration, Reports and Notices related to the conservation, management and sustainable use of wild fauna and flora and other biological resources published in 1998, which is a compendium of administrative procedures related to wildlife and describes the procedures for registering and granting permits to SOB users (Sections XVII and XVIII). The Manual omits the expression “use for subsistence purposes” but contains the no-

Table 2. The current and relevant legal framework in the use and management of song and ornamental birds in Mexico.

Legal framework	Function	Scope	Year of the first publication
Federal Civil Code	Regulation	National	1928
Convention between the Government of the United Mexican States and the United States of America for the Protection of Migratory Birds and Game Mammals	Cooperation	Global	1937
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Cooperation	Global	1973
The General Law of Ecological Equilibrium and Protection of the Environment (LEGEEPA)	Regulation	National	1988
Convention on Biological Diversity	Cooperation	Global	1992
The Procedure Manual for Authorizations, Permits, Registration, Reports, and Notices related to the conservation, management and sustainable use of wild fauna and flora and other biological resources	Administration	National	1998
The General Law of Wildlife (LGVS)	Regulation	National	2000
The Ministry of the Environment and Natural Resources' internal rules of procedures	Regulation	National	2003
Regulation for the General Law of Wildlife	Regulation	National	2006
National Development Plan	Administration	National	2007-2012
Sectorial Program for the Environment and Natural Resources	Administration	National	2007-2012
SOB Type Management Plan	Administration	National	2009
Mexican Official Standard NOM-059-SEMARNAT-2010 Environmental protection –Mexican native species of wild flora and fauna. Risk categories and specifications for its inclusion, exclusion or change –List of endangered species–	Regulation	National	2010
Agreement through which it is announced the measures of administrative simplification for the indicated subjects and issued specified forms	Administration	National	2011
Agreement through which the Ministry of the Environment and Natural Resources announced the forms and procedures concerning wildlife	Administration	National	2012
Agreement through which it announces the list of priority species and populations for conservation	Administration	National	2014

Legend: See Table 1 for abbreviations. Source: Own elaboration.

tion “use outside the UMAs,” both of which can be considered equivalent. Two agreements relevant to SOB use contain the forms and instructions needed to grant permits for SOB use and the list of priority species and populations for conservation, including 21 species of parrots and some species of passerine with potential use.

DISCUSSION

For the first time, there is a compilation of all the participating stakeholders and the applicable regula-

tion involved in SOB use in Mexico. We also present novel results –obtained by analyzing stakeholders, locations, activities, and legal framework organized according to spatial level– and by integrating two conceptual frameworks –the social situation defined by Spradley (Spradley 1980), and complex systems defined by García (2006) and Novo (1997)– we explain the use of this natural resource. Our analysis corroborated the utility of studying natural resources as complex systems for improving their management; analyzing the social situation as a complex system allowed for observing the marked differences in social situa-

tions at the different spatial levels. At the micro-level (regional scale), the predominant stakeholders are resource users belonging to the commercial sector and acting in different places. On the contrary, at the meso-level (national scale), the governmental stakeholders predominate, and their activities take place in their offices and at checkpoints. Finally, at the macro-level (global scale), the number of stakeholders, activities, and theaters of operation is distinctly low. As Garcia (2006) explains, each spatial level determines the dynamics of adjacent levels. In this case, the governmental sector (at the national scale) predominantly controls the commercial sector (at regional and national scales), and, in general, it involves more stakeholders and carries out most of the actions related to SOB use. However, the number of governmental institutions involved in SOB use management is not necessarily proportional to improved management because such multiplicity of stakeholders in Mexico may confuse the assignation of competent authorities (Roldán-Clarà *et al.* 2017).

One interviewee commented on the difficulties of mixed sector implementation: "There has been confusion over who is in charge of what species and when." For example, "CONAVIS is a handy tool, but it has been difficult to implement it." There are many government institutions involved at the national level (legal framework), making this scale extensive and complex and wondering if it is indispensable. We consider that management of SOB use in Mexico –like that of other natural resources– could be over-regulated (Bobadilla *et al.* 2011; Espinoza-Tenorio *et al.* 2011).

As shown by other studies (Sorensen *et al.* 1992), our analysis revealed multiple stakeholders, activities, and places at the three spatial levels. Stakeholders from non-governmental organizations and the academic and communication sectors act at the three spatial levels. They are currently involved in studies of the legal and illegal use of SOB, conferences, and seminars and frequently disseminate information through communication networks like the Internet. For example, an NGO can carry out a local bird conservation campaign and, at the same time, undertake a study of global bird trade, as is the case of TRAFFIC (Nash 1993). Other examples are international newspapers and news broadcasters (e.g., BBC News, The New York Times) that broadly disseminate news about SOB use. The potential to intercede in the management of resources of NGOs and stakeholders from the academic and communication sector is crucial because they contribute opinions, generate knowledge (Hart *et al.* 2011), and transmit information (Simioni 2003). Besides, since the stakeholders mentioned above usually have flexible, non-stereotyped positions, they are recognized as functional stakeholders, i.e., their function as a link with structural stakeholders from the

governmental and commercial sectors (Simioni 2003). Unfortunately, the number of these functional stakeholders is limited, so their actions are limited and uncoordinated. For instance, few research groups study birds in Mexico from the perspective of their use as pets. Descriptive studies regarding the use of wildlife, lists of used birds, and methods for calculating the use of Passeriformes (Roldán-Clarà *et al.* 2014) are noteworthy. However, Mexican journalists and communication experts rarely read this type of publications, and few researchers publish their work in magazines disseminating scientific knowledge to the general public, with noticeable exceptions such as the works of Álvarez (2003) and of López-Medellín and Íñigo-Elías (2009) and Íñigo-Elías and Enkerlin (2003) published in *Biodiversitas*.

In contrast to Simioni's opinion (2003) that functional stakeholders have non-stereotyped positions, we found a different position of the media regarding SOB use. Whenever confiscations or illegal situations occur, most of the printed and broadcasted news is sensationalist. For instance, an article published on December 16, 2007 in the Mexican newspaper "El Universal" with the title "Parrots in the clutches of the smugglers," or another article published on January 30, 2013 in the Puerto Vallarta newspaper "El Tribunal de la Bahía," which states: "[...] poachers cut a nearly 35-meter high tree to steal two macaws nests [...]". The implications of sensationalist news negatively labeled all people that use wild birds as thieves. Besides, few media provide spaces for dissemination of scientific knowledge in general and SOB knowledge in particular. Publicists and advertisers may also be relevant stakeholders because they can promote the sale and the use of birds. In this case, we must highlight the TV commercial of the company "ASM Segundamano" broadcasted and posted on the Internet throughout March of 2014, which shows the coach of a soccer team adopting a red-lored amazon (*Amazona autumnalis*), which generated colossal controversy among Mexican NGOs and some complaints to the PROFEPA (Parra 2014). Therefore, stakeholders from the academic and communication sectors and NGOs should be considered crucial, but they are not considered enough by wildlife management. However, we consider that these stakeholders acting at all spatial levels should have a higher value because of their significant influence on the activity.

CONCLUSION

We identified 24 stakeholders representing six sectors involved in SOB trading, the resource users, the governmental officers, the academics, the communicators, the non-governmental organizations and a mixed type. Resource users act mainly at the local scale,

which explains the wide variety of useful birds' activities and places. In contrast, the governmental sector is primarily active at the national scale, its main activities determined by the standing legal framework. We also found out that stakeholders from the academic and communication sectors and NGOs can simultaneously act at multiple spatial levels, which strengthens their influence on activities related to SOB use and justifies the need for paying closer attention to these stakeholders. Our results show that SOB use in Mexico encompasses a comprehensive legal framework, involves a large number of stakeholders, many places, and a significant number of activities, which is indicative of the complexity of the SOB use system in Mexico. Appropriate management of natural resources and environmental governance (Brenner 2011; Lockwood *et al.* 2010) are favored by organizing their corresponding complex systems and by comprehensively understanding the legal framework and stakeholders involved, the places where actions take place, and the different spatial levels of activities (Reed *et al.* 2009). The necessary information about the different components influencing the complex system of SOB use in Mexico that is provided by this approach also facilitates studies and searching for solutions (Novo 1997). Once the identification of all stakeholders interested in the use of SOB, it is possible to know the relationships among them and their interests and leads to understanding why some stakeholders have more influence than others in the management of SOB. In this way, Maguire *et al.* (2012) and Reed *et al.* (2009) mention it is essential to actors to place themselves as key actors; by doing that, everyone would become more deeply involved, and their actions will build a future better SOB management.

ACKNOWLEDGEMENT

We thank Anamaría Escofet for her advice on the design of the theoretical framework and Ixchel True for assistance with the figures. We acknowledge Silvia Espejel and Sergio Zárate for translating the manuscript. We also thank everyone that collaborated in interviews and, especially, the pajareros who, unconditionally, gave their time and opened us the doors to their homes.

DATA AVAILABILITY

The data used to support the findings of this study are available from the corresponding author upon reasonable request.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

CONTRIBUTION STATEMENT

She conceived the present idea: BRC (initial of the authors).

She carried out the experiment: BCR (initial of the authors).

She carried out the data analysis: BCR (initial of the authors).

Wrote the first draft of the manuscript: BRC, IE.

Review and final write of the manuscript: BCR, IE (initial of the authors).

Supervision: CL, IE, XLM (initial of the authors).

REFERENCES

Albuquerque UP, Cruz da Cunha LVF, Paiva de Lucena RF, Alves RRN (2014) **Methods and Techniques in Ethnobiology and Ethnoecology**. 1st ed. New York: Humana Press. United States of America.

Álvarez J, Bellot M, Benítez H (2003) **La ciencia en el combate al comercio ilegal de especies**. *Biodiversitas* 49:7-11.

Alves RRN, de Farias Lima JR, Araujo HFP (2012) **The live bird trade in Brazil and its conservation implications: an overview**. *Bird Conservation International* 1-13.

Bobadilla M, Alvarez-Borrego S, Avila-Foucat S, Lara-Valencia F, Espejel I (2011) **Evolution of environmental policy instruments implemented for the protection of totoaba and the vaquita porpoise in the Upper Gulf of California**. *Environmental Science & Policy* 14: 998-1007.

Brañes R (2000) **Manual de Derecho Ambiental Mexicano**. Fundación Mexicana para la Educación Ambiental. 2nd ed. Fondo de Cultura Económica. México.

Brenner L (2011) **Gobernanza ambiental, actores sociales y conflictos en las Áreas Naturales Protegidas mexicanas**. *Revista Mexicana de Sociología* 72:283-310.

Cariño M, Zariñán J (2008) **Procesos de conservación a través de la protección y el manejo de la vida silvestre**. In: Cariño M, Monteforte M, (eds) *Del saqueo a la conservación. Historia ambiental contemporánea de Baja California Sur 1940-2003*. Universidad Autónoma de Baja California Sur, Secretaría de Medio Ambiente y Recursos Naturales, México, pp. 475-570.

Castañares-Maddox EJ (2009) **Sistemas complejos y gestión ambiental: el caso del Corre-**

dor Biológico Mesoamericano. México DF. CONABIO.

CITES (2014) **Convención sobre el Comercio Internacional de Especies Amenazadas de Fauna y Flora Silvestres** <http://www.cites.org/esp/disc/what.php> Accessed 4 June 2020.

Cornell University. **Partners in Flight. Un Llamado a la Acción** (2020) <http://www.savingoursharedbirds.org/un-llamado-a-la-accion/reducir-la-mortalidad> Accessed 4 June 2020.

Cruz-Colín E, Cisneros-Mata M, Montañón-Moctezuma G, Espejel I, Cisneros Montemayor A, Malpica-Ruiz L (2021) **Analysis of the Gulf of California cannonball jellyfish fishery as a complex system.** *Ocean & Coastal Management* 207:105610.

Dajoz R (2002) **Tratado de ecología.** In Leiva Morales MJ. Translation and technical review. Madrid: Mundi-Prensa.

de Sahagún FB (1969) **Historia general de las cosas de nueva España**, 2ª ed., Garibay KÁM (ed), Porrúa. México.

DOF (Diario Oficial de la Federación) (2000) **Ley General de Vida Silvestre, México.** Última reforma DOF 7 de junio de 2011.

DOF (Diario Oficial de la Federación) (2006) **Reglamento de la ley General de Vida Silvestre.** México.

DOF (Diario Oficial de la Federación) (2014) **Acuerdo por el que se da a conocer la lista de especies y poblaciones prioritarias para la conservación, México.**

Duffy R, Moore L (2011) **Global regulations and local practices: the politics and governance of animal welfare in elephant tourism.** *Journal of Sustainable Tourism* 19:589-604

Espinoza-Tenorio A, Espejel I, Wolff M, Zepeda-Domínguez JA (2011) **Contextual factors influencing sustainable fisheries in Mexico.** *Marine Policy* 35:343-350.

García R (2006) **Sistemas complejos: conceptos, métodos y fundamentación epistemológica de la investigación interdisciplinaria.** 1ª ed. Barcelona: Gedisa Press.

Grohmann P (1997) **Los movimientos sociales y el medio ambiente urbano.** *Nueva Sociedad* 149:146-161.

Hart PS, Nisbet EC, Shanahan JE (2011) **Environmental Values and the Social Amplification of Risk: An Examination of How Environmental Values and Media Use Influence Predispositions for Public Engagement in Wildlife Management Decision Making.** *Society and Natural Resources* 24:276-291.

House of Representatives (Cámara de Diputados) (2020) <http://www.diputados.gob.mx/LeyesBiblio/index.htm> Accessed 6 June 2020.

Íñigo-Eliás EE y Enkerlin, EC (2003) **Amenazas, estrategias e instrumentos para la conservación de las aves.** Conservación de aves, experiencias en México. CIPAMEX. México, DF, pp. 86-132.

Jepson P, Ladle RJ (2005) **Bird-keeping in Indonesia: conservation impacts and the potential for substitution-based conservation responses.** *Oryx* 39:1-6.

Johnson FA, Walters MAH, Boomer GS (2012) **Allowable levels of take for the trade in Nearctic songbirds.** *Ecological Applications* 22:1114-1130.

Lockwood M, Davidson J, Curtis A, Stratford E, Griffith R (2010) **Governance Principles for Natural Resource Management.** *Society and Natural Resources* 23:986-1001.

López-Medellín X, Íñigo-Eliás EE (2009) **La captura de aves silvestres en México: Una tradición milenaria y las estrategias para regularla.** *Biodiversitas* 83:11-15.

Maddox EJC (2009) **Sistemas complejos y gestión ambiental: el caso del Corredor Biológico Mesoamericano México.** Comisión Nacional para el Conocimiento y Uso de la Biodiversidad.

Maguire B, Potts J, Fletcher S (2012) **The role of stakeholders in the marine planning process—Stakeholder analysis within the Solent, United Kingdom.** *Marine Policy* 36:246-257.

Monti A, Escofet A (2008) **Ocupación urbana de espacios litorales: gestión del riesgo e iniciativas de manejo en una comunidad patagónica automotivada (Playa Magagna, Chubut, Argentina).** *Investigaciones Geográficas* 67:113-129.

Nash SV (1993) **Sold for a song. The trade in southeast Asian non-CITES birds.** Cambridge: Traffic International.

Novo M (1997) **El análisis de los problemas ambientales: modelos y metodologías.** In Novo M, Lara R (eds) *El análisis interdisciplinario de la problemática ambiental*, F. Universidad-Empresa, Madrid, pp. 21-46.

Parkin M (2001) **Microeconomía: versión para Latinoamérica.** Pearson Educación, Alhambra Mexicana, S.A. Edo. de México.

Parra JÁ. (2014) **Acusan al "Piojo" de un acto ilícito.** El Universal, Mexico DF. Accessed 4 June 2020.

Reed MS, Graves A, Dandy N, Posthumus H, Hubacek K, Morris J, Prella C, Claire H. Quinnb, Lindsay C (2009) **Who's in and why? A typology of stakeholder analysis methods for natural resource management.** *Journal of Environmental Management* 90:1933-1949.

Reuter A, Mosig P (2010) **Comercio y aprovechamiento de especies silvestre en México: observaciones sobre la gestión, tendencias**

y retos relacionados. México. WWF. México.

Robles de Benito R (2010) **La estrategia de conservación, manejo y aprovechamiento sustentable de la vida silvestre**. In: R Durán R, Méndez M (eds) Biodiversidad y Desarrollo Humano en Yucatán. CICY, PPD-FMAM, CONABIO, SEDUMA. Mérida, México.

Roldán-Clarà B, Lopez-Medellín X, Espejel I, Arellano E (2014) **Literature review of the use of birds as pets in Latin-America, with a detailed perspective on Mexico**. *Ethnobiology and Conservation* 3:1-18. doi: [ec2014-10-3.5-1-18](https://doi.org/10.35-1-18)

Roldán-Clarà B, Lopez-Medellín X, Aguilera C, Guerrero N, Espejel I (2017a) **Mexican birds use according to government officials**. *Ethnobiology and Conservation* 6:1-18. doi: [ec2017-08-6.13-1-18](https://doi.org/10.6.13-1-18)

Roldán-Clarà B, Toledo VM, Espejel I (2017b) **The use of birds as pets in Mexico**. *Journal of ethnobiology and ethnomedicine* 13:1-18.

SEMARNAP (Secretaría de Medio Ambiente y Recursos Naturales y Pesca) (1997) **Programa de Conservación de la Vida Silvestre y Diversificación Productiva en el Sector Rural**. Mexico.

SEMARNAP, INE (Secretaría de Medio Ambiente y Recursos Naturales y Pesca, Instituto Nacional de Ecología) (2000) **Proyecto de Recuperación de Especies Prioritarias. Proyecto para la conservación, manejo y aprovechamiento sustentable de los psitácidos de México**. Mexico, Distrito Federal: Subcomité Técnico Consultivo para la Conservación.

SEMARNAT (Secretaría de Medio Ambiente y Recursos Naturales) (2013) <http://www.SEMARNAT.gob.mx/temas/gestion-ambiental/vida-silvestre/consejovs> Accessed 4 June 2020.

Simioni D (2003) **Contaminación atmosférica y conciencia ciudadana**. United Nations, Comisión Económica para América Latina y el Caribe. Santiago, Chile.

Sorenses JC, McCreary ST, Brandani A (1992) **Arreglos institucionales para manejar ambientes y recursos costeros**. Centro de Recursos Costeros, Universidad de Rhode Island.

Spradley JP (1979) **The ethnographic interview**. Harcourt Brace Jovanovich College Publishers. Orlando, Estados Unidos de América.

Spradley JP (1980) **Participant observation**. Thompson Learning, Estados Unidos de América.

Taylor SJ, Bogdan R (1984) **Introducción a los métodos cualitativos de investigación**. L'Hospitalet de Llobregat: Paidós Ibérica.

The Avian Welfare Coalition (2020) <http://www.avianwelfare.org/index.htm> Accessed 4 June 2020.

Received: 08 July 2020

Accepted: 01 September 2021

Published: 14 September 2021

Editor: Rômulo Alves