Perceived wetland wildlife in a North African urban setting: conservation implications

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Abstract	Using a questionnaire approach, we investigated the perceptions of local residents towards the wildlife of an urban pond. The survey was conducted against the backdrop of an ongoing decrease of the waterfowl and widespread poaching practices. Results revealed that birds were the most attractive wildlife component of the wetland ecosystem, suggesting that birds may successfully be used as flagship species for local conservation programs. In addition, 65% of the respondents believed that a decline in waterfowl had occurred in the last decade, and 74% confirmed that poaching was an ongoing practice, thus revealing an acute awareness of their environment. While mitigation efforts such as improving livelihood and empowering local residents cannot be understated, the sustainable management of North African urban wetlands still requires more insights into socio-economic and ecological issues.
Keywords	Algeria, Urban wetland, wildlife perception, conservation implication, human-wildlife interactions.

Perception de la faune des zones humides dans un milieu urbain méditerranéen.
Implications pour la conservation

Résumé	En utilisant une approche par questionnaire, les perceptions des résidents locaux à l'égard de la faune d'un étang urbain ont été étudiées. L'enquête a été menée dans le contexte d'une diminution continue de la sauvagine et de pratiques de braconnage généralisées. Les résultats ont révélé que les oiseaux constituaient les espèces les plus attrayantes des zones humides, ce qui suggère que les oiseaux peuvent être utilisés avec succès comme des espèces porte-drapeau dans les programmes de conservation locaux. De plus, 65 % des répondants pensent qu'un déclin de la sauvagine s'est produit au cours de la dernière décennie, et 74 % ont confirmé que le braconnage était une pratique continue, révélant ainsi une conscience aiguë de leur environnement. Bien que des efforts mitigés tels que l'amélioration des moyens de subsistance et l'autonomisation des résidents locaux ne puissent être sous-estimés, la gestion durable des zones humides urbaines d'Afrique du Nord nécessite encore davantage de connaissances sur les questions socio-économiques et écologiques.
Mots-clés	Algérie, zones humides urbaines, perception de la faune, implication de la conservation, interactions homme-faune.

Introduction

Due to social and economic contexts, a global expansion of urban areas has occurred at the expense of natural landscapes (LAMBIN *et al.,* 2001; MCDONALD *et al.,* 2008; SETO *et al.,* 2011), thus leading to the fragmentation and isolation of habitats, threatening biodiversity (MCKINNEY, 2002) and increasing interactions and conflicts between wildlife and humans. Hence, there is a need to integrate the human dimension as part of the environmental management (ALBERTI *et al.,* 2003; BENNETT *et al.,* 2017; HOGAN, 2007), especially in ecosystems embedded within an urban landscape where people frequently interact with nature and wildlife (ADAMS *et al.,* 2005; SAVARD *et al.,* 2000).

People's perceptions towards wildlife determine the success of conservation efforts in urban settings, as attitudes may markedly influence conservation efforts and results

(HOSAKA *et al.,* 2017). Therefore, investigating perceptions and people's response to wildlife provides valuable insights into understanding human-wildlife interactions in urban areas (SOULSBURY & WHITE, 2015).

Human-wildlife interactions are a set of conflicts and benefits that occur between humans and wildlife, which influence negatively or positively tolerance toward wildlife (CARPENTER *et al.,* 2000; KARANTH *et al.,* 2019). Knowledge and experiences of local residents with neighboring wildlife, as well as several socio-demographic factors such as age, education, gender and socio-economic status, are factors that may shape the perception of wildlife (KELLERT & BERRY, 1980; KELLERT, 1984; KRETSER *et al.,* 2009), thus leading to a positive or negative human attitude toward wildlife (MORZILLO *et al.,* 2014).

Moreover, it has been emphasized that human connectedness to nature is often influenced by socio-economic and landscape changes (BALÁZSI *et al.,* 2019; RIECHERS *et al.,* 2020). Therefore, to successfully implement a biodiversity conservation program, it is necessary to take into account socio-demographic factors and landscape characteristics.

Urban wetland provides a range of ecosystem services including flood regulation, recreational and aesthetic value, climate regulation and sewage treatment (BOLUND & HUNHAMMAR, 1999; OERTLI & PARRIS, 2019). In addition, small and isolated urban wetlands like urban ponds are as important as large wetlands in terms of biodiversity con-servation priorities (OERTLI *et al.,* 2002; WILLIAMS *et al.,* 2004).

This study aims to investigate the perceptions of Boussedra residents toward neighboring wildlife and explore socio-demographic factors influencing these perceptions in a North African setting, where in the context of climate change, freshwater may be a source of potential conflicts between humans and biodiversity.

Methods

Study area

Boussedra is an urban pond located at El Bouni, near the town of Annaba, northeastern Algeria (Fig. 1). This unpro-tected wetland has been subjected to intense anthro-pogenic pressures which has caused a precipitous reduction of its former size (F. SAMRAOUI *et al.,* 2012). Boussedra pond provides important breeding and over-wintering grounds for many waterbird species like the endangered White-headed Duck *Oxyura leucocephala* and the near-threatened Ferruginous Duck *Aythya nyroca* (SAMRAOUI & SAMRAOUI, 2008), both protected by Algerian legislation. The site also provides an important habitat for freshwater invertebrates and vertebrates like *Pleurodeles poireti,* an en-dangered micro-endemic newt, threatened by habitat loss (B. SAMRAOUI *et al.,* 2012).
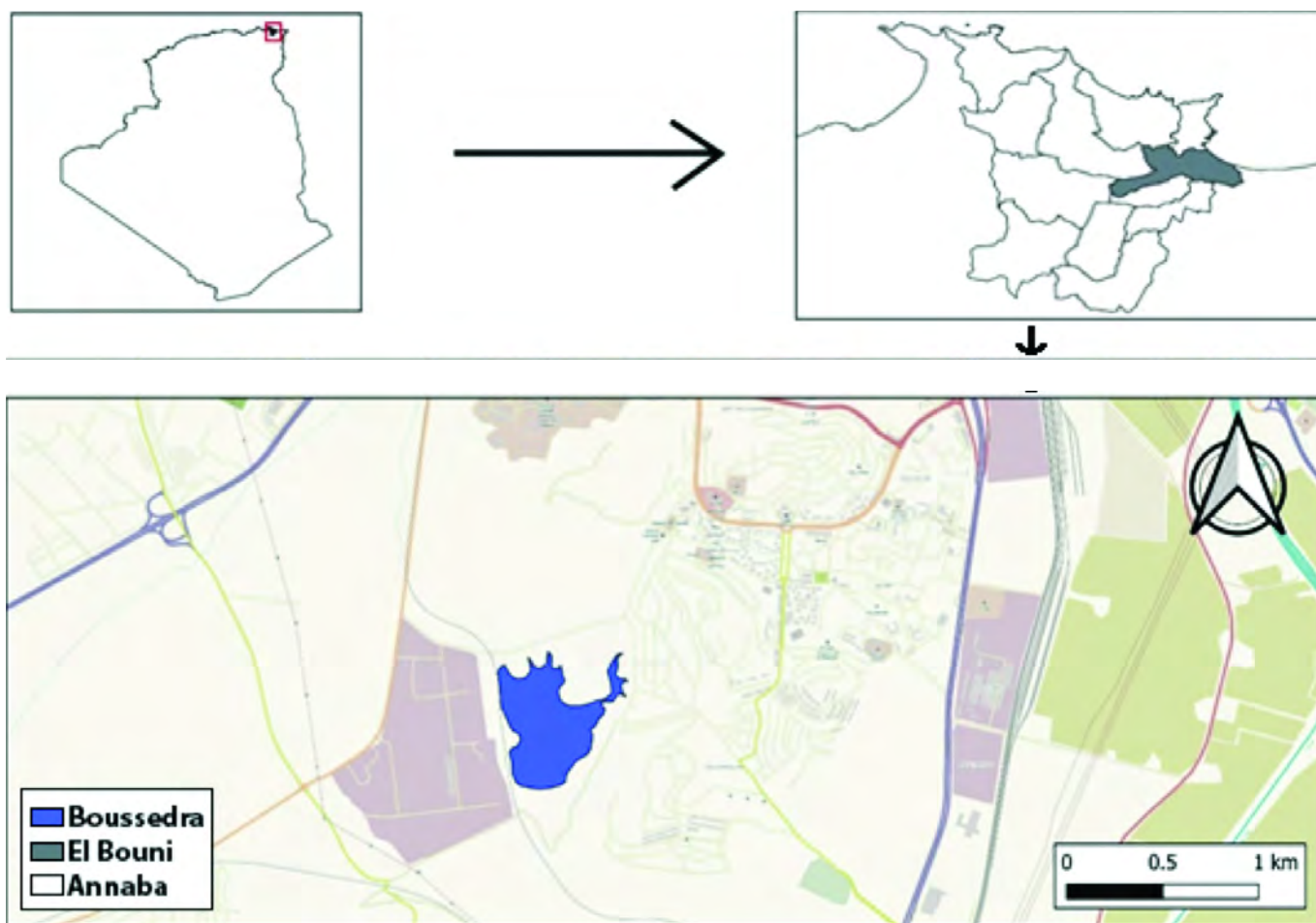

Figure 1
Location of Boussedra Pond at Annaba in north-eastern Algeria.
Localisation de l'étang de Boussedra, à Annaba dans le nord-est de l'Algérie.

Table I

Socio-demographic characteristics of the respondents. NAs represent the percent of respondents with unknown status.
Caractéristiques sociodémographiques des répondants. Les NA représentent le pourcentage de répondants dont le statut est inconnu.

Variable	Stats / values	Count	Percent frequency	NA
Gender	1. Men	63	(64.29%)	
	2. Women	35	(35.71%)	
Age	1. 15-24	17	(17.35%)	(2.04%)
	2. 25-34	39	(39.80%)	
	3. 35-45	19	(19.39%)	
	4. 46-55	1	(01.02%)	
	5. 55+	20	(20.41%)	
Education level	1. Elementary school	16	(16.33%)	(3,06%)
	2. High school	38	(38.78%)	
	3. Middle school	17	(17.35%)	
	5. University level	12	(12.24%)	
	6. Without formal education	11	(12.24%)	
Profession	1. Farmer	1	(01.02%)	(2.04%)
	2. Laborer	23	(23.47%)	
	3. Official	14	(14.29%)	
	4. Salesman	7	(07.14%)	
	5. Student	5	(05.10%)	
	6. Unemployed	46	(46.94%)	

Questionnaire design and administration

The questionnaire was composed of three different sections. The first section contains information about the socio-demographic characteristics of the interviewed participants such as gender, age, profession, education level, and duration of residency. The second section includes dichotomous questions (Yes/No) aiming at providing information on observations and feelings of the respondents towards the wetland wildlife present at Boussedra Pond. The third section documents people's awareness of the pond's degradation through changes in wildfowl diversity, and the residents' stance on hunting practices. The questionnaire was constructed with 15 closed-ended questions with one or multiple-choice responses (DÖRNYEI & TAGUCHI, 2009; ZALIDIS & MANTZAVELAS, 1996). The questionnaire (N = 83) was carried out at the El Bouni suburb, which surrounds Boussedra Pond, by means of either a face-to-face interview for a period of 20 to 30 minutes, or a self-administered questionnaire (SAQ) where the questionnaire was distributed to respondents and then collected the following week.

Data analysis

Socio-demographic characteristics and responses concerning the observation of and the preference for groups of animals as well as threats to water birds were analyzed by calculating percentage frequencies. All statistical analyses and graphs were carried out using R (R Development Core Team 2020).

Results

Socio-demographic aspects

A total of 83 local residents were interviewed of which 64,3 were men and 35,7% were women. The age class of respondents with the highest frequency (39,8%) was among the 25-34 years, while the second most frequent class (20,41%) included those over 55 years old (Table 1). Most respondents attended school with 38.8% having a high school degree, and more than 16% having an elementary education or middle school level. Only 12.2% of respondents were without formal education. Another major socio-demographic factor was the work force heavily tilted towards unemployment, which represented the preponderant status (46.9%) of the respondents, followed by laborers and officials with 23.5% and 14.3%, respectively. Residency of respondents ranged from 0 to 50+ years. The mean residency was 16 years, with the majority of respondents (N=30) stating having lived in the region for the past 15 years. Only five respondents claimed that they had been living there for more than 50 years.

Wildlife records and threats

Responses about wildlife awareness indicated that birds and mammals were the most visible fauna with 95% and 26%, respectively. In contrast, recorded frequencies of invertebrates and fish did not exceed 6% (Fig. 2A). The survey indicated a favorable bias towards birds, selected by 91% of respondents, followed well behind by fish with only 3% of the interviewees (Fig. 2B).

Concerning the perceived threat toward water birds, 65% stated having noticed a decrease in species richness, whereas 10% refuted this claim. The rest (22%) were indifferent to any putative trend (Fig. 3A). Among the respondents who supported the idea of a decrease in water bird richness, 43% considered that it had occurred during the past 5-10 years, followed by 29%, who suggested that it had happened during the past 5 years (Fig. 3B). Furthermore, 74% asserted that hunting activities were currently practised at Boussedra, whereas 14% denied that such activities

were present (Fig. 3C). The majority of the respondents (93%) denied any involvement with hunting (Fig. 3D).

Discussion

The surveyed population of Boussedra was, in its majority, dominated by young adults, reflecting Algerian demographics. Indeed, Algeria holds a large young population as 24.6% are aged 15 to 24 and 53% are under 30 (European Training Foundation, 2019). Characteristically, most interviewees were unemployed, reflecting once again the high national unemployment rates among young adults: 28% and 48% for males and females, respectively (European Training Foundation 2019). These soaring rates of unemployment are recorded against the background of a shrinking economy badly hit by the recent oil price slump. Finally, most respondents had elementary or no education and, due to lack of job opportunities, are in large part absorbed by the informal sector, which accounted for 45% of total jobs created over the period 2000-2007 (ACHY, 2010). Among both uneducated and educated youth, the lack of skills makes the transition from school to the labor market a challenging task.

Establishing human-wildlife coexistence in a context of economic hardship is a challenge requiring a trade-off between environmental and socio-economics issues, which consists of conserving biodiversity and natural resources while improving human well-being (CEAUȘU et al., 2018; MCSHANE et al., 2011). The goal would be to reach a compromise that takes into consideration both humans and wildlife components. Thus, there is a need for good governance to make the economy more competitive, create jobs, and empower citizens at a local scale. In parallel to enhancing people's well-being, public campaigns and environmental education programs may be useful approaches for removing irrational attitudes (MADDEN, 2004) and emphasizing wildlife benefits, in order to promote co-existence between local residents and wildlife, and to enhance the involvement of people (EBUA et al., 2011; HOSAKA et al., 2017; MOHAMAD MUSLIM et al., 2018).

Animal bias

With regard to awareness and interest in wildlife, our results corroborate those of ARIAS-GARCÍA et al. (2016), indicating that birds are the most recorded and most preferred animals in a wetland landscape. The preponderance of observations and predilection toward birds over all other animal groups are explained by the high birdlife diversity that wetlands can harbor, as well as other important social and cultural value that birds represent (ARIAS-GARCÍA et al., 2016; GREEN & ELMBERG, 2013). Moreover, the preference of an animal is influenced by several factors like aesthetic value, usefulness, size, and perceived threat it may represent, hence people tend to prefer aesthetically attractive and inoffensive animals such as birds (CZECH et al., 1998; NASSAUER, 2004; SCHLEGEL & RUPF, 2010). In contrast, invertebrates are distrusted and negatively perceived, often associated with damage and disease (KELLERT, 1993). Therefore, the public's preferences for birdlife among other faunal groups may support conservation effort, where waterfowl can be used as flagship species (KOPER & SCHMIEGELOW, 2006). In addition, reducing negative perceptions towards invertebrates such as insects involves implementing an environmental education campaign that raises awareness of the ecological role of these animal groups (HOSAKA et al., 2017; LEANDRO & JAY-ROBERT, 2019).

Biodiversity and human well-being

Although, human-wildlife interactions are often reduced to human-wildlife conflicts (SOULSBURY & WHITE, 2015), evidence is growing that biodiversity is also providing
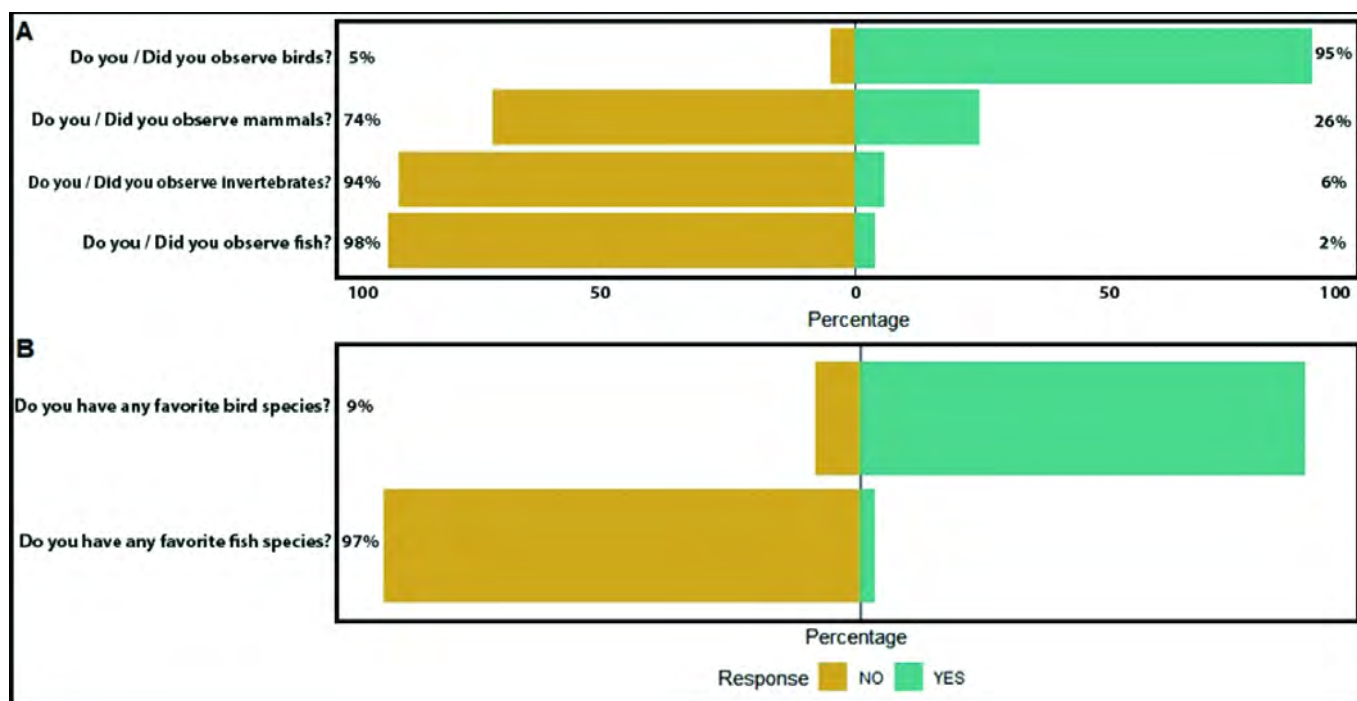
Figure 2
Responses regarding the records (A) and the predilection (B) of local people for wildlife animal groups.
Réponses concernant l'observation (A) et la prédilection (B) des populations locales pour les groupes d'animaux sauvages.

psychological benefits by improving human health (FULLER et al., 2007; METHORST et al., 2020). Moreover, ecosystem services and biodiversity may influence human well-being (CLARKSON et al., 2013; DÍAZ et al., 2006; MILLENNIUM ECOSYSTEM ASSESSMENT, 2005). Numerous studies have revealed that species richness of birds and human well-being were positively related (DALLIMER et al., 2012; LUCK et al., 2011; SHWARTZ et al., 2014). The identification and acquisition of benefits from biodiversity are essential components of conservation (NORTON-GRIFFITHS, 1998). Thus, efforts to increase urban residents' awareness about nature around them may be a key strategy for slowing or averting extinction.

Influence of improved livelihood on hunting

The responses concerning the decrease of bird species richness highlight the fact that respondents are know-ledge-able about the situation facing birdlife in their neighbor-hood. The majority of respondents are aware that waterfowl hunting is often practised at Boussedra Pond while insisting that they do not indulge in such a practice. Despite existing national laws regulating hunting practices and providing formal protection to threatened species, waterfowl poaching and harvesting of eggs remain a common practice in Algerian wetlands (SAMRAOUI et al., 2013), in unprotected areas like Boussedra, but also in protected areas such as the Mekhada marsh (COULTHARD, 2001) or Lake Tonga (AYAICHIA et al., 2017; FOUZARI et al., 2015) which are Ramsar sites. Despite the implementation of environmental policy and law, these illegal practices and the consequences they can have on the dynamics of water birds highlight the weak enforcement of existing laws (FOUZARI et al., 2015; MEZIANE et al., 2014).

In addition to law enforcement and hunting restrictions, a holistic approach including awareness and participation is needed in order to both enhance perceptions of wildlife and reduce poaching activities (EPANDA et al., 2019). Moreover, the implementation of wildlife conservation is often confronted with socio-economic issues, which implies improving both livelihoods and perceptions of the local populations (PERSHA et al., 2010). The positive perceptions may be amplified by education at an early age of the multiple ecosystem services provided by Boussedra Pond which is an oasis offering nutrient cycling, carbon storage, flood protection and aesthetic and recreational values. Boussedra Pond is also a thriving natural laboratory to students and researchers investigating the machinery of nature.

The foundation of a conservation strategy of Boussedra Pond could be laid out around charismatic species like the White-headed Duck and the Ferruginous Duck. An action plan could be drafted along similar lines to the one focused on another emblematic species, the Greater Flamingo, *Phoenicopterus roseus* (BÉCHET & SAMRAOUI, 2010). This latter has proven to be a successful umbrella species that helped confer a formal protection to many Algerian salt lakes and their inhabitants. However, conservation of wetlands embedded in an urban landscape cannot be reduced to an environmental mission thus excluding the socio-economic aspects of local communities. Therefore, effective conservation should be based on public support through synergistic measures that encompass environmental policy, integrated management, and awareness and education programs (AYAICHIA et al., 2017; SALAFSKY et al., 2002).

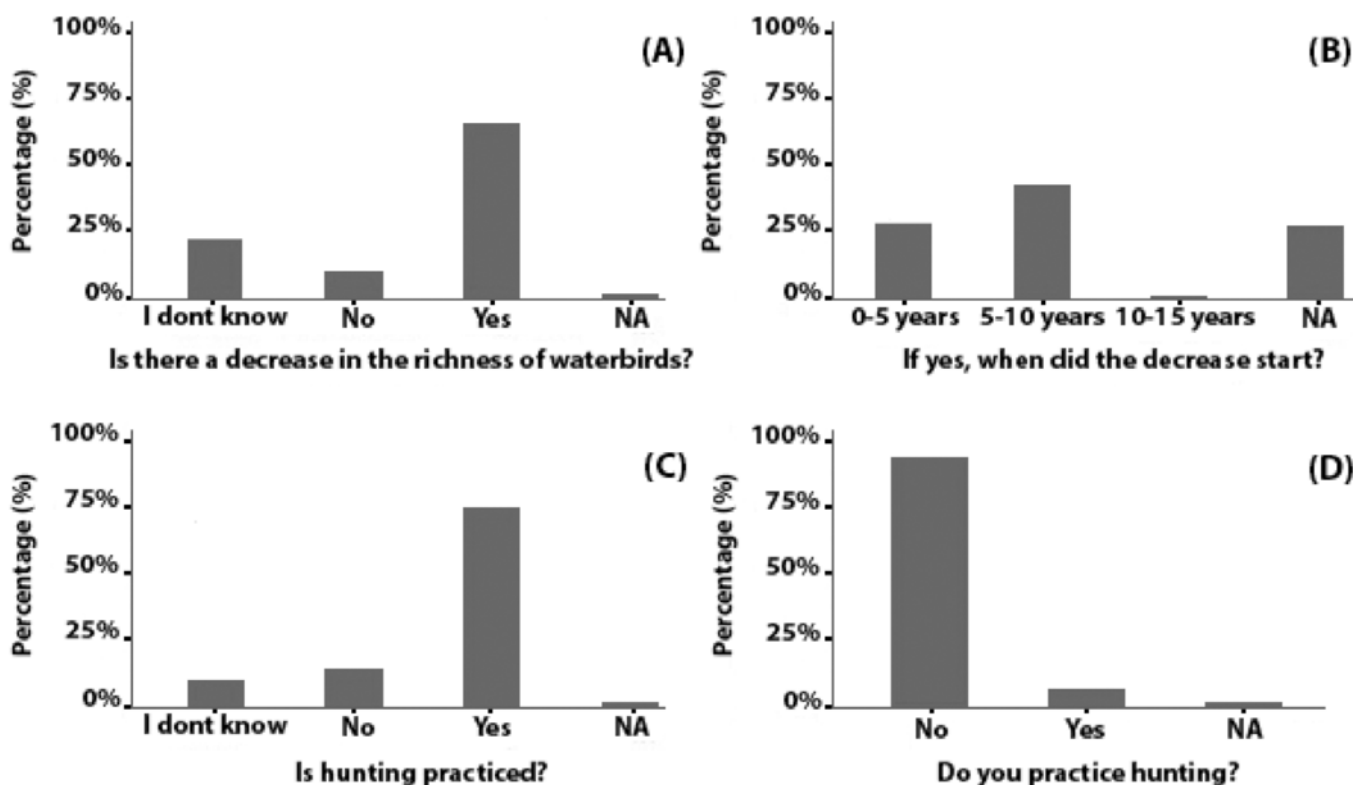In conclusion, conservation and management of urban wetlands must integrate an interdisciplinary approach involving

Figure 3
People's perception of water birds' decline and hunting.
La perception que les locaux ont de la diminution de l'effectif des oiseaux d'eau et de la chasse.

political, socio-economic, and ecological aspects, attempting to achieve an environmental and social sustainability.

Acknowledgements

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