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Characteristics of the Habitat and Population Densities of the Mexican Duck (*Anas diazi*) in the Plateau of Zacatecas, Mexico

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Simple Summary: The Mexican duck is considered an endangered species by Mexican law due to its population dynamics and the destruction of the wetlands in which it occurs. This duck inhabits the Central Mexican Plateau, where the aquatic ecosystems show a significant deterioration as a consequence of pollution and the inadequate use of the resources of the region. However, there is scarce or zero information regarding the plant characteristics and the type of wetland that the Mexican duck inhabits. Therefore, a series of wetlands were selected, taking into account the presence of Mexican duck populations, in which adjacent and aquatic vegetation were analyzed in relation to the duck's population density. The vegetation was characterized by a structure composed, for the most part, of graminean and shrub species and the presence of aquatic vegetation; collected data showed that a population occupied mainly artificial wetlands in the studied area, which was found to be the main factor underlying the selection of wetlands by the Mexican duck in the Plateau of Zacatecas.

Abstract: The Mexican duck (*Anas diazi*) is an endemic species that has been categorized as threatened because of its practice of living in small populations and because of the condition of the wetlands in which it occurs. Therefore, the preference for wetlands by the species is influenced by the adjacent vegetation composition found in the Mexican Central Plateau in the state of Zacatecas. The inclination of the duck towards the wetlands in relation to the aquatic and adjacent vegetation structure was evaluated in the studied area. Seven wetlands were selected and distinguished by the presence of a population of the species. Vegetation was analyzed in three strata—tree layer, shrub layer and herb layer—and the population of the Mexican duck was calculated through direct counting in each wetland. The results determined a significantly larger number of individuals in artificial wetlands than in lakes. The wetlands' adjacent vegetation is constituted by graminean and shrub species, with an aquatic vegetation cover. The non-parametric Mann–Whitney U test showed a significant difference between the counts of ducks and the physical structure of wetlands in the examined area. The data obtained indicate that the Mexican Duck occurs mainly in artificial wetlands with mainly graminean vegetation and aquatic plant cover; similar characteristics to those previously described for dabbling ducks.

Keywords: habitat; adjacent vegetation; aquatic vegetation cover; wetlands; endemic species

Citation: Mercado-Reyes, M.; Valtierra-Marín, H.E.; Delgadillo-Ruiz, L.; Valdéz-Romero, E.; Chávez-Ruvalcaba, M.I.; Chávez-Ruvalcaba, F.; Ramírez-Hernández, L.A.; Tavizón-García, P. Characteristics of the Habitat and Population Densities of the Mexican Duck (*Anas diazi*) in the Plateau of Zacatecas, Mexico. *Birds* **2024**, *5*, 509–521. https://doi.org/10.3390/birds5030034

Academic Editor: Jukka Jokimäki

Received: 7 June 2024
Revised: 9 August 2024
Accepted: 12 August 2024
Published: 16 August 2024

1. Introduction

The Mexican duck is a non-migratory endemic species included in the group of dabbling ducks. This species spreads in lakes and marrows in the central plateaus within the Central Mexican Plateau, running to the north along the eastern base of the Sierra Madre Occidental and the basin of the Rio Grande up to the state of Chihuahua in Mexico and the southern part of the states of Arizona, New Mexico, and Texas in the United States. It also runs to the south, starting in the Trans-Mexican Volcanic Belt in the states of Mexico, Tlaxcala, and Puebla, throughout the central plateau in Zacatecas, Guanajuato, and Michoacán [1,2]. The Mexican duck was considered as a species in the 1957 American Ornithologists Union Check-list (5th Edition) until it was removed and included as a subspecies of the mallard (*Anas plathyrhynchos*), being identified with the scientific name *Anas plathyrhynchos diazi* in 1983 (American Ornithologists Union Check-list, 6th Edition). This process led to a controversy regarding the taxonomy of the species until 2020, when the American Ornithologists Society (AOS) finally defined it as *Anas diazi* species [3–11]. Due to its occurrence in small populations and the destruction of its habitat, the Mexican duck was protected by the U.S. Endangered Species Act as an endangered species in 1967, from which it was later removed by the United States Fish and Wildlife Service in 1978 as a result of its classification as a subspecies of the mallard. This removal stopped it from being considered a vulnerable species. The previous situation led to a lack of information on the Mexican duck as a species, which precluded the development of an evaluation of conservation; on the other hand, some studies demonstrate that the species shows a certain ability to adapt to agricultural habitats and that this characteristic could provide stability to its populations [12]; however, insufficient evidence has been provided for the Mexican duck to be considered as an endangered species [13,14]. Nonetheless, some authors maintain that this species presents a decreasing tendency in its populations since it is affected mainly by the destruction of its habitat resulting from anthropogenic activities such as hydric resource deviation for agriculture and the destruction of nesting zones and eggs provoked by the trampling of livestock or agricultural machinery [4,15–17]. Therefore, they suggest that it should be considered as endangered, and this situation has been taken into account in Mexican legislation, which defines it as an endangered species [18].

Studies have described some of the population tendencies in Mexico. Pérez-Arteaga [13] states that during the period 1960 to 2000, 16% of the total population of the Mexican duck was found in the mountainous region of northern Mexico, whereas 84% of the population was found in the central mountainous region. From 2001 on, these numbers changed to 31% and 69% of the population, respectively. Currently, there is not enough information to determine its population tendency, so it is suggested that it keep its endangered species status while further information is generated [13,14].

The Mexican wetlands are part of the natural environment of different Nearctic species of aquatic migratory and resident birds, which guarantees the preservation of a high percentage of their populations [5,19–22]. Their biological diversity is associated with their biota and their geographical location within the Mexican territory [3,23]. The abundance of aquatic birds is determined by a range of factors like hydrological state, the heterogeneity of the area, size, and vegetation structure [17,24]. Dabbling ducks are associated with habitats that possess high and extensive shrubs, which are part of their nesting zones. Because of this, they are recognized as suitable habitat zones for different species of ducks. Duck population is related to factors such as grass size, weed amount, and the structure of different mammalian predator communities [25,26]. The complexity of the vegetation structure has been directly associated with the richness of duck species [27,28] as it promotes a variety of invertebrates which form part of the diet of aquatic birds [29,30]. The habitat selection process of dabbling ducks is behavioral since they prefer areas that fulfill the requirements of providing resources with viable characteristics and also offer shelter for the ducks against predators [31–33]. Ringelman [34] and Kleyheeg [35] remark that a 50:50 proportion between open water and emergent vegetation in the wetlands is frequently selected by aquatic birds. In addition, Laskowski [36] maintains that the structural

diversity of the habitat constitutes a relevant factor for dabbling ducks, pointing out that a simple vegetation cover is not enough for their survival, which leads to their heterogeneity. Williams [37] describes a change in the distribution of Mexican duck populations according to two main seasons in the Mexican Plateau: the dry season (May to June) and the rainy season, which suggests that this change is due to a change in the availability of resources for the species.

The habitat of the Mexican duck requires three basic elements: open waters with dense vegetation cover on the shores, wetlands with medium depth, and an adjacent slope that allows young individuals to move into the vegetation cover for protection [38,39]. This species inhabits lakes and shallow water vessels, choosing a wetland with a presence of bulrush (*Typha* sp.) [40,41], areas with Mesquite trees (*Prosopis* sp.), graminean, and riparian zones or lowlands [38]. The Central Mexican Plateau includes five physiographic regions: Sierra Madre Occidental, Central, Sierra Madre Oriental, the Bajío Zone, and the Trans-Mexican Volcanic Belt [40]; the first three areas compose what is considered the Northern Plateau located in the Mexican state of Zacatecas. This region includes permanent and stationary marshes that belong to closed marshes or endorheic wetlands that have been substantially altered or destroyed by anthropogenic activities, for example, agriculture, overgrazing, and pollution generated by surrounding communities [42,43]. In general, these areas do not present riparian vegetation, and they have turbid waters along with a constant presence of livestock [6,44].

The Mexican duck is affected by the destruction of its habitat due to the deviation of water resources employed in the watering of regional crops; this is partially compensated by artificial wetlands [40], indicating that habitat loss is one of the main problems. Climate change is another factor that alters the habitat of the species [45]; the alterations in rainfall and runoff are fundamental in determining the composition of the species and the productivity of the ecosystems, where the existence of wetlands depends on water availability. By the same token, extended periods of drought cause wetlands to dry, decreasing their capacity of retention and water storage [46].

The information obtained in studies about the habitat of dabbling ducks, including the Mexican duck, points towards two important factors: the composition of wetlands-adjacent vegetation (both aquatic and riparian) and the physical structure of the wetlands; for this reason, it is hypothesized that these factors could influence the presence and population density of the Mexican duck in the plateau of Zacatecas. The objective of the present study is to characterize the type of wetlands where this species occurs, as well as the structure of their adjacent vegetation in the Plateau region.

2. Materials and Methods

2.1. Study Area

The Plateau of Zacatecas is part of the geographical area known as *Tierras Altas del Centro de México* (Central Mexican Highlands), which is identified as a high plateau between mountains, with arid and semi-arid weather conditions. There are no rivers of importance in this biogeographical province [43,47]. Wetlands in this region include permanent and stationary marshes that belong to closed basins, as well as endorheic wetlands that present considerable deterioration via the substantial alteration and destruction provoked by changes in soil use and the overexploitation of resources at the human hand [14,42]. Tavizón [48] notes that in the state of Zacatecas, Mexican ducks can be found in lakes, marshes, and artificial water reservoirs all the year, in which they become acquainted with migratory species, such as the snow goose (*Chen caerulescens*) and the greater white-fronted goose (*Anser albifrons*). Seven wetlands were selected based on the abundance of the Mexican duck population in the area; they were classified typologically using the aquatic system to which they belong as a basis according to the method described by Cervantes [23] and RAMSAR [49]. Following the established typological classification, two types were recognized: lake and artificial pond (Table 1). The selected points were located in the major corridor of migratory aquatic birds in the State, which covers a strip of 8400

km^2 (840,000 ha), using hydrological regions, basins, subbasins, and aquifers to delimit it (Figure 1).

Table 1. Typology and geographical location of the study wetlands in the Plateau of Zacatecas.

Wetlands Type	Characteristics	Wetland Study	Municipality	Size (ha)	Coordinates
Lakes	Of any origin; unstable, they depend on the rainfall regime; depth less than 8 m; presence of organic matter, with turbidity	*Chilitas*	Zacatecas	39.58	22°39′59.92″ N 102°40′00.32″ W
		Bañuelos	Guadalupe	33.98	22°39′03.70″ N 102°30′33.05″ W
		La Zacatecana	Guadalupe	62.55	22°39′59.92″ N 102°40′00.32″ W
Artificial ponds	Temporary or permanent; they store water for various activities (agriculture, livestock, etc.)	*Matanuzka*	Ojocaliente	0.389	22°28′43.55″ N 102°15′36.26″ W
		El Maguey	Zacatecas	3.711	22°48′05.28″ N 102°43′09.68″ W
		El Manantial	Luis Moya	0.654	22°27′42.96″ N 102°11′47.42″ W
		Las Mangas	Guadalupe	6.12	22°42′42.76″ N 102°31′37.21″ W

Reference: Cervantes [23].

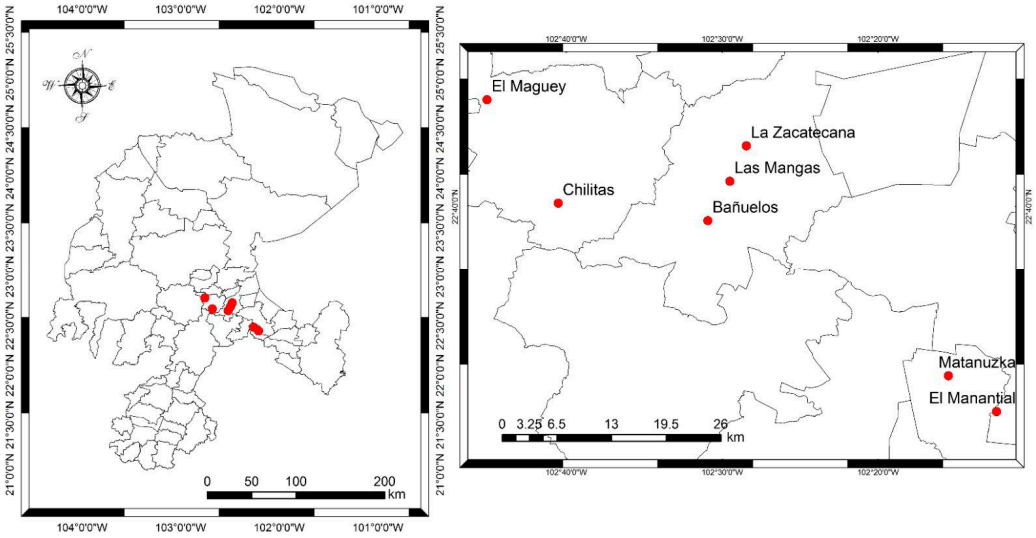

Figure 1. Study area located within the major corridor of migratory aquatic birds in the state of Zacatecas, Mexico.

The so-called wetlands of *La Zacatecana*, *Bañuelos*, and *Chilitas*, defined as lakes, are under the legal status of common land or *ejido*, which is the greatest factor underpinning environmental issues in Mexico [50]. There exist neighboring human settlements around these wetlands. These settlements provoke water pollution in each of the lakes as a result of anthropogenic activities that take place within these areas, particularly livestock (bovines and goats), agriculture (with inefficient watering systems), mining (heavy metal waste in the wetland of *La Zacatecana*), and hunting (exclusively in the wetland of *Chilitas*). As a result, their adjacent areas display a highly eroded soil caused by the loss of vegetation cover and wind action. The vegetation was characterized by the predominant presence of halophytic vegetation, shrubs, and natural grassland.

The wetlands of *El Maguey*, *El Manantial*, *Matanuzka*, and *Las Mangas* were classified as artificial ponds; these are artificial wetlands whose main use is agriculture, with the

exception of the pond known as *El Manantial*, which was created for the purpose of conservation, and *Las Mangas*, the main purpose of which was to serve as a water trough for livestock. The artificial ponds of El Maguey and *El Manantial* are used as water troughs only during the dry season. They mainly present a vegetation structure of natural grassland and emergent aquatic vegetation.

Areas adjacent to the wetlands were vegetation with mesquite (*Prosopis* sp.), prickly pear cactus (*Opuntia* sp.), huisache (*Acacia farnesiana*), and native natural pasture. Only the wetland of *Las Mangas* was characterized by the presence of natural grassland.

The fluctuation in temperature during the spring–summer period goes from 27 to 12 °C, and during the period of fall–winter, temperatures vary from 21 to 3 °C, with freezes during December and January. The average annual rainfall ranges from 300 to 600 mm during the months of May to October and from 25 to 50 mm in the period from November to April [44,51]. In the period 2004 to 2005, during the dry period (January to May), there was a rainfall average of 12.65 mm in the municipalities of Guadalupe and Zacatecas; while in the municipalities of Luis Moya and Ojocaliente, the rainfall average was 4.8 mm. During the rainy season (June to September), the average was 93.62 mm and 71.05 mm, respectively [52].

2.2. Characterization of the Vegetation in the Studied Wetlands

In order to determine the size of the wetlands and the type of adjacent vegetation, an analysis of geographical information was carried out using digitized maps of the region, which were made with ArcView 9.1 software. To characterize the adjacent vegetation of each wetland quantitatively, an analysis was carried out during the period June 2004 to May 2005 in three different strata: tree strata (>2 m height); shrub strata (0.7 m to 2 m width); and herb strata (<0.7 m height). Transects were established, directed to the four cardinal points in each wetland, with a length of 50 m and intervals of 5, 25, and 50 m each, starting on the shore of the wetland. In each interval of the wetlands, different quadrants were positioned. For the tree strata, a 10 × 10 m quadrant was placed, resulting in a total surface of 1200 m^2; for the shrub strata, a 4 × 4 m quadrant was placed, resulting in a total surface of 192 m^2; finally, for the herb layer, a 1 × 1 m quadrant was placed, resulting in a total surface of 12 m^2 [44,53,54]. Within the quadrants corresponding to the tree and shrub strata, species, individuals by species, density, and cover were registered. Subsequently, relative density (RD = the density of a given species in relation to the total density of all species), relative frequency (RF = the frequency of a given species in relation to the total frequency of all species), relative cover (RC = the cover of a particular species or life form as a percentage of total plant cover for all species), and the importance value index of each species (IVI = (RD + RF + RC)/3) were calculated [44,55]. The latter value offers a global estimation that quantifies the importance of individual species in the plant community [55,56]. Aquatic vegetation was characterized through linear transects of 6 m in length out in the river bank, which were oriented towards the cardinal points. In each of them, 1 × 1 (12 m^2) quadrants were established in intervals of 2, 4, and 6 m to determine the aquatic vegetation cover of emerging, submerged, and floating species [44,57].

2.3. Population Counting of the Mexican Duck

To determine the population size of the Mexican duck, four censuses were conducted in each wetland, which were established in two key periods for the study region, namely, the dry season, i.e., February to March (count 1) and April to May (count 2), and the rainy season, i.e., June to July (count 3) and September to October (count 4), so each wetland was realized twice for each period. The population size of the Mexican duck (number of individuals per unit area of water surface) in the study area was determined by counting the number of ducks present in each wetland, considering the size, in hectares, of each one. For wetlands larger than 10 hectares identified as lakes (La Zacatecana, Chilitas, and Bañuelos), the Hayne method was used, in which at least two observers equipped with Swift 15 × 60 mm BCF Vanguard Binoculars-847 binoculars participated; the counts were

carried out from the shore of the wetlands along transects of variable length (150 + 50 m), and the total number of individuals observed was counted. For wetlands smaller than five hectares (El Maguey, El Manantial, Matanuzka, and Las Mangas), direct counts were performed, and the total number of ducks present was obtained; the choice of counting method was based on the size of the wetland analyzed [21,44,58–60]. These direct counts were performed in periods of 3 h each in the morning (from 7 to 10 h) and/or in the afternoon (from 16 to 19 h). The results are described as the total number of individuals present during each count. Finally, the abundance of the Mexican duck in each wetland is described as the population density (number of individuals/hectare) of each wetland, which was estimated by averaging the total number of counts made in each wetland.

2.4. Statistical Analysis

In order to determine if there is a significant difference between the number of present individuals of Mexican duck species, the dry and rainy seasons in the region, and the vegetation characteristics in the studied ponds and lakes, the non-parametric Mann–Whitney U test was applied for independent samples; on the other hand, a correspondence analysis was performed to determine the similarity of the vegetation characteristics among the analyzed wetlands. All the statistical tests were conducted with SPSS Ver. 29.0 software. Correspondence analysis is a statistical technique used to explore the relationships between categorical variables in a dataset. It helps to visualize and understand how different categories of one variable are associated with categories of another variable. By plotting the data on a graph, correspondence analysis makes it easier to see these relationships and identify significant associations, which can be useful for decision-making in fields like marketing, ecology, and social sciences [11].

3. Results

3.1. Characterization of the Adjacent Vegetation

The analyzed wetlands presented a vegetation composition constituted by 71.4% of thorn scrub, 100% of natural grassland, 57.1% of prickly pear cactus, and, in general, 60% of adjacent agricultural areas. For those typified as lakes, the tree layer displayed an absolute density of 0.25 (relative density: 6.48). The identified species were Huisache (*Acacia* sp.), Mesquite (*Prosopis* sp.), pepper tree (*Schinus* sp.), and screwbean mesquite (*Prosopis pubescens*). The species that presented the widest cover area was huisache, with an index of 47.1%. For the artificial ponds, the data showed an absolute density index of 0.36 (relative density: 10.26). Mesquite was the species that occurred the most frequently (29.29%), but poplars (*Populus* sp.) and willows (*Salix* sp.) were also identified; in this case, mesquite was the species that provided the highest cover (39.94). The artificial pond known as El Manantial showed 61.5% of the total of the identified tree species.

The shrub layer in the lakes showed an absolute density index of 4.81 (18.67 of relative density), and it was constituted by 60.5% of occurrence frequency of Catclaw acacia (*Acacia greggii*) and 23.4% of prickly pear cactus (*Opuntia* sp.), respectively. Other species were also identified with less frequency, including lemon Dalea (*Dalea capitata*), maguey (*Agave* sp.), and mule fat (*Baccharis salicifolia*), with 1.23% of frequency each. The shrub species that occurred the most frequently was *Acacia greggi* (47.62%), while the species that showed the highest cover was *Opuntia* sp., with a value of 54.02%. In the artificial ponds, the identified species were *Acacia* sp. and *Opuntia* sp. In the artificial pond known as *El Maguey*, neither arboreal nor shrub species were identified within the sampling points. In the *Las Mangas* artificial pond, neither density nor cover were identified in the tree and shrub strata; its vegetation structure was only constituted by natural grassland. Regarding the herb strata, graminean were the predominant species in all the wetlands, except for the lake of *Chilitas*, in which herbaceous plants were predominant (58.87%). The results are displayed in Table 2.

Table 2. Quantitative characterization of the tree and shrub species identified in the analyzed lakes within the area of study.

Common Name	Scientific Name	Lakes				Artificial Ponds			
Tree Strata		**RD%**	**RF%**	**RC%**	**IVI%**	**RD%**	**RF%**	**RC%**	**IVI%**
Huisache	*Acacia* sp.	45.3 ± 20.85	53.3 ± 17.64	47.1 ± 40.74	48.6 ± 26.05	31.2 ± 44.19	27.2 ± 38.56	18.6 ± 26.36	25.7 ± 36.37
Mesquite	*Prosopis* sp.	26.8 ± 27.83	24.4 ± 21.43	27.4 ± 28.25	26.2 ± 25.38	4.5 ± 2.37	10.1 ± 1.42	39.9 ± 54.0	18.2 ± 17.67
Screwbean mesquite	*Prosopis pubescens*	11.1 ± 19.24	11.1 ± 19.24	3.5 ± 6.07	8.5 ± 14.85	-	-	-	-
Pepper tree	*Shinus molle*	16.6 ± 28.87	11.1 ± 19.25	21.9 ± 38.01	16.5 ± 28.71	25.6 ± 7.91	29.2 ± 9.99	32.7 ± 39.90	29.2 ± 19.27
Fremont cottonwood	*Populus fremonti*	-	-	-	-	20.7 ± 1.41	11.1 ± 15.71	2.3 ± 3.30	7.9 ± 11.23
Willow	*Salix* sp.	-	-	-	-	56.3 ± 3:53	22.2 ± 31.42	6.3 ± 8.96	18.9 ± 26.73
Shrub strata									
Catclaw acacia	*Acacia greggii*	51.7 ± 19.38	47.6 ± 19.05	35.9 ± 31.13	41.4 ± 18.18	50 ± 3.53	8.3 ± 11.78	2.7 ± 3.89	12.0 ± 17.01
Prickly pear	*Opuntia* sp.	38.7 ± 26.06	34.9 ± 21.47	54.0 ± 42.58	46.2 ± 31.04	25 ± 35.35	41.6 ± 58.92	47.2 ± 66.81	37.9 ± 53.69
Agave	*Agave* sp.	2.56 ± 4.44	4.76 ± 8.25	2.51 ± 4.35	3.28 ± 5.68	-	-	-	-
Lemon dalea	*Dalea capitata*	4.02 ± 6.97	7.93 ± 13.75	3.91 ± 6.78	5.2 ± 9.17	-	-	-	-
Mule fat	*Baccharis salicifolia*	0.57 ± 0.99	1.58 ± 2.75	0.34 ± 0.6	0.83 ± 1.45	-	-	-	-
Candelilla	*Euphorbia antisyphilitica*	1.7 ± 2.98	1.5 ± 2.75	1.9 ± 3.41	1.7 ± 3.05	-	-	-	-
Gobernadora	*Larrea* sp.	0.57 ± 0.99	1.58 ± 2.75	1.2 ± 2.19	1.14 ± 1.98	-	-	-	-

RD = relative density; RF = relative frequency; RC = relative cover; IVI = importance value index. Note: blank spaces in the table mark the absence of the species.

When comparing the vegetation in the analyzed wetland, the collected data on the tree strata showed a significant difference in density ($z = 2.725$, $p < 0.05$) and cover ($z = 3.077$, $p < 0.05$) of arboreal species among all the analyzed wetlands. There was no significant difference between the shrub and herb strata in the shrub strata.

3.2. Aquatic Vegetation Cover

The emergent aquatic vegetation cover was confirmed by common cattail (*Typha* sp.), rush (*Juncus* sp.), and cordgrasses (*Spartina* sp.), which were identified in the superficial ponds of *Matanuzka* and *El Manantial* and in the *Bañuelos* lake. The species of bentgrass (*Agrostis* sp.) and beard grass (*Polypogon* sp.) were registered in the artificial ponds of *El Maguey* and *Las Mangas* and in the lakes of *La Zacatecana* and *Chilitas.* The major percentage of emergent cover was seen in the artificial ponds (47.8% in *Matanuzka* and 33.9% in *El Manantial*); in *El Maguey*, the cover percentage was low (1.6%). Both floating and submerged aquatic vegetation covers varied in the lake category; the highest percentages were found in *La Zacatecana* lake (33.75% and 80%, respectively). The non-parametric statistical test did not expose a significant difference between the type of wetland analyzed.

3.3. Mexican Duck Population

The Mexican duck population in the studied wetlands displayed a total of 3319 individuals. Its distribution regarding the type of wetland was registered as follows: in the lakes, it was a total of 828 ducks; whereas in the artificial ponds, it was a total of 2491 ducks

on average. According to the data obtained from the conducted counts, the Mexican duck occurred the most in the artificial ponds during said counts (484, 698, 767, and 542 in counts 1, 2, 3, and 4, respectively) compared to the ones registered in the lakes, which showed a lower number of individuals during the same counts (164, 457, 52, and 155 individuals, respectively). In the artificial pond of *Las Mangas*, the presence of populations was only observed during census 1 and 2 (123 and 260 individuals each); during census 3 and 4, no individuals were observed in the wetland (Table 3). Statistically, a significant difference between the population size of the Mexican duck in each wetland was identified (ANOVA: $F_{6,21} = 2.416$, $p < 0.05$). These results confirm the observation of a larger population of Mexican ducks occurring in artificial ponds rather than in lakes. The non-parametric Mann–Whitney U test showed that there is a significant difference between the number of individuals present in the wetlands classified as ponds than in the ones classified as lakes ($z = -2.185$, $p < 0.05$). When comparing the number of counted ducks and the dry and rainy season for each type of wetland (pond or lake), it was observed that there is a difference in the number of ducks counted in the lakes during the dry season of the study period; however, the non-parametric Mann–Whitney U test showed that there is no significant difference between the number of individuals present in the wetlands during each analyzed season and the type of wetland (lakes, $z = -1.444$, $p < 0.05$ and artificial ponds $z = 1.314$, $p < 0.05$).

Table 3. Mexican duck population size by study wetland. The total number of individuals counted in each census (months) and the population density are shown.

Wetlands Type	**Total Number of Ducks**				**Population Density/ha**
Lakes	Feb–Mar	Apr–May	Jun–Jul	Sep–Oct	
La Zacatecana	82	418	0	140	2.55/ha
Bañuelos	22	7	2	15	0.34/ha
Chilitas	60	32	50	0	0.90/ha
Ponds					
Las Mangas	123	0	0	260	15.64/ha
El Maguey	182	322	361	116	66.08/ha
Matanuzka	139	56	215	308	461.43/ha
El Manantial	40	60	191	118	156.34/ha

The correspondence analysis showed that there is a significant association or correspondence ($p = 0.0529$) between the number of counted Mexican ducks and the type of wetland (artificial ponds or lakes), showing a tendency of a higher number of ducks in ponds than in lakes (Figure 2).

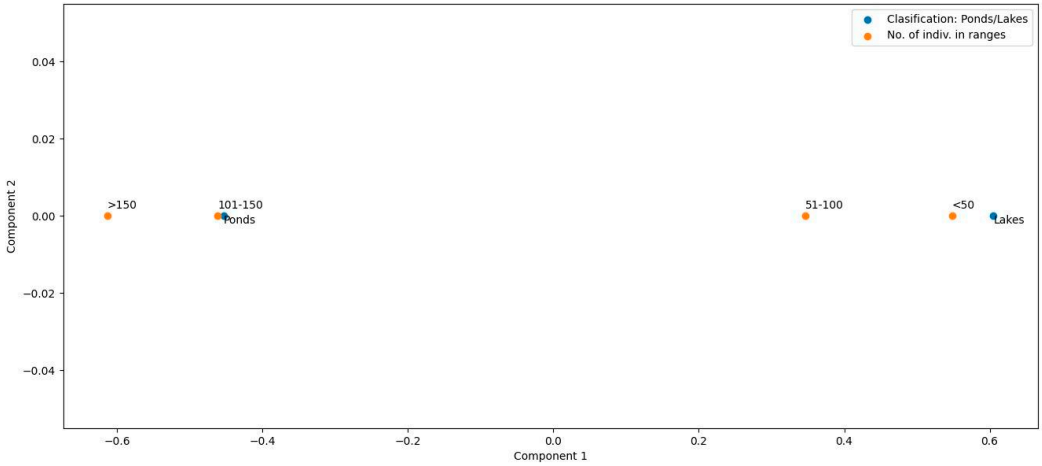

Figure 2. Analysis of correspondence of the number of counted ducks according to the type of analyzed wetland (artificial ponds and lakes).

The adjacent vegetation of the wetlands is characterized mainly by the presence of graminean, with an apparent difference in the cover of arboreal species between the type of wetland analyzed in the present study (mainly observed in lakes); on the other hand, regarding the analysis of data of vegetation structure, the Mann–Whitney U test did not show a significant difference ($p < 0.05$); these factors influence the population density of the Mexican duck in the area of study.

4. Discussion

It was found that there is a higher population density in artificial ponds than in lakes, which was also shown in the correspondence test, and this indicates the existence of an association between the number of counted ducks and the type of wetland (artificial pond), so the hypothesis is accepted regarding the physical structure of the wetlands; it is an important factor that has an influence on the population density of the Mexican duck in the studied area. In the data analysis of the counted ducks per type of reservoir and season (rainy and dry), a slight increase in ducks in lakes was observed during the dry season; however, when conducting the statistical analysis of these data, it was found that there is no significant difference in the usage of lakes by ducks during this period. These results could suggest that other environmental factors interfere in the selection of lakes by the Mexican duck.

The number of Mexican ducks was significantly larger in the artificial ponds than in the lakes; these data revealed that despite the availability of the water supply and space in lakes, the species showed an evident preference for artificial ponds. The latter corroborates the predilection for shallow water bodies by the Mexican duck species, as previously described by Leopold [15], Nudds [28], Swepston [38], and Mercado [44]. These authors establish that shallow wetlands display a wider vegetation diversity due to their physical constitution and their transition from gradients of meadow to steppe, being consistent with the present description of results. In *Las Mangas* artificial ponds, during the wet season (census 1 and 2), the presence of the Mexican duck was observed; however, during the dry season (census 3 and 4) the presence of the species was not observed as a consequence of the presence of livestock. Medina [20], Braun [61], and Riojas-López [62] mention that the agricultural artificial ponds are chosen by the Mexican duck because these ducks seek to avoid a deteriorated habitat. Likewise, these wetlands maintain restricted access to livestock (bovine and equine), which represents a benefit for the growth and conservation of the wetland's adjacent vegetation [20,27,44], as well as ensuring less disruption. Ringelman [34] defines livestock activities as a factor that deteriorates the habitat of aquatic species as they cause erosion and sediment accumulation in water bodies, resulting in severe damage to the riparian habitats. Also, due to their agricultural purpose, the artificial ponds are close to crop areas, which could become a possible shelter for this and other grassland and wetland bird species [61] since they provide water and food during dry periods. These periods are an important limiting factor in the dynamics of dabbling ducks populations [63].

The positive relationship between dabbling duck populations and agricultural areas has been widely documented [25,51,64], including with respect to the Mexican duck species [37,38,40,44]. Scott and Reynolds [51] described an adaptive behavior of the Mexican duck in wetlands where agricultural activities are developed, which become an important habitat for the survival of Mexican duck populations due to the preservation of the adjacent vegetation and the availability of food sources [40]. Nevertheless, an important parameter affecting the behavior of the populations is the suffering of predation caused by the reduction in the vegetation cover due to agriculture [25,44]. Another determinant factor that could be affecting the small number of observed individuals in lakes is the disturbance caused by the livestock and leisure activities that are carried out in these wetlands. The presence of livestock in the wetlands is associated with a decrease in the adjacent vegetation and a deterioration of the habitat caused by cattle trampling and soil compaction around the wetland area.

The composition of the adjacent vegetation in the studied wetlands was mainly constituted, in the tree strata, by the huisache species, shrubs, and grassland; the composition of adjacent vegetation was constituted by shrub species, graminean, and aquatic vegetation. These results indicated that the habitat of the Mexican duck in the Plateau of Zacatecas is similar to what has been reported in earlier investigations [20,38,44,65]. According to different authors [28,66,67], the density and diversity of dabbling duck species has been correlated with the structural diversity of aquatic vegetation, as well as the abundance of emergent vegetation. Aquatic vegetation is an important resource for dabbling duck species since a variety of survival aspects depend on this factor, for example, nesting zones, protection against predators, climate change, and visual isolation among fellow ducks [31,44].

Another aspect that involves the presence of this type of vegetation is the fact that it is part of the habitat of invertebrate communities [68,69], which are an important food source for different species of dabbling ducks, especially during the mating season [34,44,68]. The former was corroborated by the presence of various invertebrate species (freshwater snails and bivalves) that are a part of the diet of the Mexican duck populations in the studied wetlands ([44], unpublished data). In the artificial ponds and in the *Bañuelos* lake, the species of emergent aquatic vegetation that were observed were common cattail (*Typha* sp.) and rush (*Juncus* sp.), which constitute a part of the vegetation cover selected by the Mexican duck [38,40] as it relies on dense emergent vegetation patches adjacent to nesting areas without the occurrence of livestock in order to assure reproductive success [44,62].

With respect to the lakes, with the exception of that of *Bañuelos* and *Las Mangas* artificial pond, the emergent cover was constituted by perennial vegetation that was abundant during a short period of time after the rainy season (September to November) but scarce during the dry season (February to June). This type of vegetation has been a part of the description of the habitat of other dabbling duck species, for instance, the mottled duck (*Anas fulvigula*) and the northern pintail (*Anas acuta*) [44,70], which inhabit areas with perennial shrub and grassland structures [71].

This study of the Mexican duck in the Zacatecas Plateau confronts several limitations, such as the geographic location between wetlands, which makes data collection difficult; the insecurity that can occur in some parts of the region, which limits the development of field work; and the modification and/or creation of wetlands characterized as ponds, since, due to drought conditions, they can disappear or be modified or reappear during the beginning of the rainy cycle, which can alter the movement of Mexican duck populations.

5. Conclusions

The population density of the Mexican duck is higher in ponds than in lakes, which suggests a preference for this type of wetland, which presents an adjacent vegetation constituted mainly by graminean species and a habitat modified by agricultural landscapes. On the other hand, an increase in the number of counted ducks was observed during the dry seasons of the region, even though the statistical analysis did not show a significant difference between the rainy seasons and the type of wetland in the region, which suggests that other factors could be contributing to the increase in ducks in lakes. In the northern zone of Mexico, where the Mexican Plateau is located, one of the main issues is water; in this case, the use of infrastructure such as artificial ponds for the collection of hydric resources is a common method that has provided an important and alternative habitat for Mexican duck populations. These data are still prevailing, despite the effects of climate change and the poor management of hydric resources. The creation and conservation of artificial ponds is still promoted in the region, hence the preservation of the population of the Mexican duck in the Mexican state of Zacatecas. Mexican wetlands are as relevant in the conservation of aquatic birds as they are in the United States and Canada, being considered in projects for the management of aquatic birds in North America, including the Mexican duck. Therefore, information regarding their natural history and ecology is important for future evaluations of the conservation of the species in the distribution area.

Author Contributions: M.M.-R.: writing—original draft and investigation, visualization, and writing—review and editing; L.D.-R. and E.V.-R.: resources and methodology; M.I.C.-R. and F.C.-R.: methodology and writing—review and editing; H.E.V.-M.: formal analysis and supervision; P.T.-G.: writing—original draft and investigation, visualization, and writing—review and editing; L.A.R.-H.: formal analysis. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original contributions presented in the study are included in the article.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Delgado-Díaz, D.M.; Zarza, H.; Flores-Hernández, N.; Cruz-Monterrosa, R.G.; Rayas-Amor, A.A.; Díaz, R.M.; Jiménez-Guzmán, J.; García-Garibay, M.; Miranda de la Lama, G.; Hernández-Flores, L.I. Presencia de metales pesados en Pato Mexicano (*Anas diazi Ridgway*). *Agroproductividad* **2019**, *12*, 89–92. [CrossRef]
2. Batt, D.J.B. Introduction: The Waterfowl. In *Ecology and Management of Breeding Waterfowl*; University of Minnesota Press: Minneapolis, MN, USA, 1992; pp. xii–xxi.
3. Padilla, P.; Romero, E.; García, L.J.; Cruz, I.; Alcalá, Y. Nuevos registros y listado de protozoarios y artrópodos de aves acuáticas de la familia Anatidae en humedales mexicanos. *Act. Zool. Mex.* **2022**, *38*, 1–24.
4. Aldrich, J.W.; Baer, K.P. Status and speciation in the Mexican Duck (*Anas diazi*). *Wilson Bull.* **1970**, *82*, 63–73.
5. Perez-Arteaga, A.; Jackson, S.F.; Carrera, E.; Gaston, K.J. Priority sites for wildfowl conservation in Mexico. *Anim. Consv.* **2005**, *8*, 41–50. [CrossRef]
6. Chesser, R.T.; Billerman, S.M.; Burns, K.J.; Cicero, C.; Dunn, J.L.; Kratter, A.W.; Lovette, I.J.; Mason, N.A.; Rasmussen, P.C.; Remsen, J.V., Jr.; et al. Sixty-first Supplement to the American Ornithological Society's Check-list of North American Birds. *Auk* **2020**, *137*, 1–24. [CrossRef]
7. American Ornithological Society. Available online: https://americanornithology.org/about/committees/nacc/current-prior-proposals/2020-proposals/ (accessed on 17 July 2024).
8. Hoyo, J.; Collar, N.J.; Christie, D.A.; Elliott, A.; Fishpool, L.D.C.; Boesman, P.; Kirwan, G.M. Passerines. In *HBW y Birdlife International Illustrated Checklist of the Birds of the World*; Lynx Edicions y BirdLife International: Barcelona, Spain; Cambridge, UK, 2016; Volume 2.
9. Clements, J.F.; Rasmussen, P.C.; Schulenberg, T.S.; Iliff, M.J.; Fredericks, T.A.; Gerbracht, J.A.; Lepage, D.; Spencer, A.; Billerman, S.M.; Sullivan, B.L.; et al. *The eBird/Clements Checklist of Birds of the World*; v2023b; Cornell University Press: Ithaca, NY, USA, 2023.
10. IOC World Bird List (v10. 2). Available online: https://www.worldbirdnames.org/new/ (accessed on 22 July 2024).
11. Sourial, N.; Wolfson, C.; Zhu, B.; Quail, J.; Fletcher, J.; Karunananthan, S.; Bandeen-Roche, K.; Bèland, F.; Bergam, H. Correspondence analysis is a useful tool to uncover the relationships among categorical variables. *J. Clin. Epidemiol.* **2010**, *63*, 638–646. [CrossRef] [PubMed]
12. All about Birds. Available online: https://www.allaboutbirds.org/guide/Mexican_Duck/lifehistory (accessed on 19 July 2024).
13. Perez, A.; Gaston, K.J.; Kershaw, M. Population trends and priority conservation sites form Mexican Duck Anas diazi. *Bird Conserv. Int.* **2002**, *12*, 35–52. [CrossRef]
14. Clemente, F.; Carmona, R.; Palacio, J.; Martínez, I.; Danemann, G.D.; Valdez, R.; Ortega, J.A. Patos y gansos de México. In *Ecología y Manejo de Fauna Silvestre en México*; Colegio de Postgraduados: Guadalajara, Mexico, 2014; pp. 159–190.
15. Leopold, A.S. *Wildlife of Mexico, the Game Birds and Mammals*; University of California: Berkeley, CA, USA, 1959; pp. 126–201.
16. Bellrose, F.C. Mortality and disease. In *Ducks, Gesse and Swans of North America*; Stackpole Books: Harrisburg, PA, USA, 1980; pp. 68–73.
17. Cisneros, E. Aves acuáticas migratorias, sus habitats y manejo de humedales. In *Diplomado en Manejo de vida Silvestre. Conservación y Manejo de Vertebrados del Norte Árido y Semiárido de México*; CONABIO, INE-SEMARNAP, USFWS y UANL: Mexico City, Mexico, 1999; pp. 147–190.
18. Diario Oficial de la Federación. Lista de Especies en Riesgo de la Norma Oficial Mexicana NOM-059-SEMARNAT-2010, Protección Ambiental-Especies Nativas de México de Flora y Fauna Silvestres-Categorías de Riesgo y Especificaciones Para su Inclusión, Exclusión o Cambio-Lista de Especies en Riesgo. Available online: https://www.biodiversidad.gob.mx/especies/catRiesMexico (accessed on 2 May 2024).
19. Wilson, M.H.; Ryan, D.G. Conservation of Mexican wetlands: Role of the North American Wetlands Conservation Act. *Wild. Soc. Bull.* **1997**, *25*, 57–64.
20. Barragán, J.; López, E.; Babb, K.A. Spatial and temporal variation patterns of a waterfowl community in a reservoir system of the Central Plateau, Mexico. *Hydrobiologia* **2002**, *467*, 123–131. [CrossRef]

21. Medina, S.M.; Márquez, M.; García, M.E. Uso y selección de embalses por el pato mexicano (*Anas diazi*) en la región del Llano, Aguascalientes-Jalisco, México. *Act. Zool. Mex.* **2007**, *23*, 163–181. [CrossRef]
22. Rocha, G.O.E.; Estrada, M.C.; Rodríguez, B.M.; Vázquez, S.M.M.; Antaño, D.L.A. *Plan de Manejo Tipo Para el Manejo, Conservación y Aprovechamiento Sustentable de Aves Acuáticas y Playeras*; Secretaría de Medio Ambiente y Recursos Naturales: Miguel Hidalgo, México, 2009; pp. 15–18.
23. Cervantes, M. Conceptos fundamentales sobre ecosistemas acuáticos y su estado en México. In *Perspectivas Sobre Conservación de Ecosistemas Acuáticos en México*; INE-SEMARNAT: Mexico City, Mexico, 2007; pp. 37–67.
24. Blanco, D.E. Los humedales como hábitat de aves acuáticas. In *Tópicos Sobre Humedales Subtropicales y Templados de Sudamérica*; ORCYT-UNESCO: Montevideo, Uruguay, 1999; pp. 208–217.
25. Greenwood, R.J.; Sargeant, A.B.; Johnson, D.H.; Cowardin, L.M.; Shaffer, T.L. Factors associated with duck nest success in the prairie pothole region of Canada. *Wildl. Monogr.* **1995**, *128*, 1–57.
26. Maresh, S.B.; Ribic, C.A.; Niemuth, N.D.; Bernath, J.; Zuckerberg, B. Sensitivity of North American grassland birds to weather and climate variability. *Conserv. Biol.* **2024**, *38*, 1–15.
27. Mellink, E. Grazing and Mexican ducks in central Mexico. *Euphonia* **1994**, *3*, 5–7.
28. Nudds, T.D.; Elmberg, J.; Pöysä, H.; Sjöberg, K.; Nummi, P. Ecomorphology in breeding Holarctic dabbling ducks: The importance of lamellar density and body length varies with habitat type. *Oikos* **2000**, *91*, 583–588. [CrossRef]
29. Armstrong, D.P.; Nudds, T.D. Factors influencing invertebrate size distributions in prairie potholes and implications for coexisting duck species. *Freshw. Invertebr. Biol.* **1985**, *4*, 41–47. [CrossRef]
30. Devries, J.H.; Armstrong, L.M.; Howerter, D.W.; Emery, R.B. Waterfowl distribution and productivity in the Prairie Pothole Region of Canada: Tools for conservation planning. *Wildl. Monogr.* **2023**, *211*, 1–49. [CrossRef]
31. Kadlec, J.A.; Smith, L.M. Habitat Management for Breeding Areas. In *Ecology and Management of Breeding Waterfowl*; University of Minnesota Press: Minneapolis, MN, USA, 1992; pp. 590–601.
32. Stolley, D.S.; Edmonds, S.T.; Meteyer, C.U. Mortality of ducklings of the black-bellied whistling duck (*Dendrocygna autumnalis*) during their premier swim in a hypersaline lake in South Texas. *Southwest. Nat.* **2008**, *53*, 230–235. [CrossRef]
33. Perez-Arteaga, A.; Monterrubio, R.T.; Huacuz, D.C.E.; Herrerías, D. Nidos y nidadas de pato mexicano (*Anas diazi*) en Pénjamo, Guanajuato, México. *Acta Univ.* **2019**, *29*, 1–9. [CrossRef]
34. Ringelman, J.K. 13.2. 7. Identifying the Factors That Limit Duck Production. In *Waterfowl Management Handbook*; US Fish & Wildlife Service: Fort Collins, CO, USA, 1992; pp. 1–8.
35. Kleyheeg, E.; van Dijk, J.G.B.; Tsopoglou-Gkina, D.; Woud, T.Y.; Boonstra, D.K.; Nolet, B.A.; Soons, M.B. Movement patterns of a keystone waterbird species are highly predictable from landscape configuration. *Mov. Ecol.* **2017**, *5*, 1–142. [CrossRef] [PubMed]
36. Laskowski, H. *Dabbling Ducks. Maryland Cooperative Extension*; Fact Sheet: College Park, MD, USA, 1993; p. 610.
37. Williams, S.O. The Mexican Duck in Mexico: Natural History, Distribution, and Population Status. Ph.D. Thesis, Colorado State University, Fort Collins, CO, USA, 1980.
38. Swepston, D.A. Job No. 42. Mexican duck. Final report. Federal Aid Project no. W-103-R-9. In *Federal Aid in Wildlife Restoration ACT*; Parks and Wildlife Department: Austin, TX, USA, 1979.
39. Mellink, E.; Valenzuela, S. Estudio preliminar sobre los hábitats acuáticos y ribereños en la planicie occidental potosina y sugerencias para su manejo. *Agrociencia* **1991**, *1*, 59–71.
40. Leopold, A.S. Parte II. Las aves de caza. Orden *Anseriformes*. In *Fauna Silvestre de México*, 2nd ed.; 2nd Reprint; PAX-México: Mexico City, Mexico, 1983; pp. 146–229.
41. Loges, B.W.; Tavernia, B.G.; Wilson, A.M.; Stanton, J.D.; Herner-Thogmartin, J.H.; Casey, J.; Ziemba, L.C. *National Protocol Framework for the Inventory and Monitoring of Nonbreeding Waterbirds and Their Habitats: An Integrated Waterbird Management and Monitoring Initiative (IWMM) Approach*; Natural Resources Program Center: Fort Collins, CO, USA, 2021; pp. 1–126.
42. Carrera, E.; De la Fuente, G. *Inventario y Clasificación de Humedales en México*; Parte I; Ducks Unlimited de México AC: Mexico City, Mexico, 2003; pp. 1–237.
43. Baldassarre, G.A.; Bolen, E.G. Major waterfowl habitats in Borth America in Waterfowl. In *Waterfowl Ecology and Management*; John Wiley & Sons, Inc.: New York, NY, USA, 1994; pp. 375–439.
44. Mercado, R.M. Ecología y Genética de la Conservación del Pato Triguero *Anas platyrhynchos diazi* en el Altiplano Zacatecano. Ph.D. Thesis, Universidad Autónoma de Nuevo León, San Nicolás de los Garza, Mexico, August 2012.
45. Bárbaro, B.M.; Hernández, E.A.; Elizalde, B.H. Los humedales ante el cambio climático. *Investig. Geog.* **2005**, *37*, 127–132.
46. Rojas, M.; Campos, M.; Alpízar, E.; Bravo, C.J.; Córdoba Muñoz, R. *El Cambio Climático y los Humedales en Centroamérica: Implicaciones de la Variación Climática para los Ecosistemas Acuáticos y su Manejo en la Región*; IUCN, Regional Office for Meso-America: San José, Costa Rica, 2003; pp. 1–38.
47. Ferrusquía-Villafranca, I.; Gonzalez, G.L.I.; Cartron, J.L.E. Northern Mexico's Landscape, Part I: The Physical Setting and Constraints on Modeling Biotic Evolution. In *Biodiversity, Ecosystems, and Conservation in Northern Mexico*; Oxford University Press: New York, NY, USA, 2005; pp. 11–27.
48. Tavizón, P.; Flores, R.; Díaz, M.; Mondragón, C. Gestión para la conservación del hábitat del pato triguero (*Anas platirhynchos diazi*) en el estado de Zacatecas, México. In Proceedings of the XIV Congreso Nacional de Zoología SOMEXZOOL, Guanajuato, Mexico, 4 November 1997.

49. Berlanga-Robles, C.A.; Ruiz-Luna, A.; De la Lanza, E.G. Esquema de clasificación de los humedales de México. *Investig. Geograf.* **2008**, *66*, 25–46.
50. Stoleson, S.H.; Felger, R.S.; Ceballos, G.; Raish, C.; Wlson, M.F.; Búrquez, A. Recent History of Natural Resource use and Population Growth in Northern Mexico. In *Biodiversity, Ecosystems, and Conservation in Northern Mexico*; Oxford University Press: New York, NY, USA, 2005; pp. 52–86.
51. García, E. *Modificaciones al Sistema de Clasificación Climática de Köppen (Para Adaptarlo a las Condiciones de la República Mexicana)*; Offset Larios: Mexico City, Mexico, 1988; pp. 1–217.
52. Normales Climatológicas por Estado. Available online: https://smn.conagua.gob.mx/es/informacion-climatologica-por-estado?estado=zac (accessed on 18 July 2024).
53. Matteucci, S.D.; Colma, A. Atributos y variables. In *Metodología para el Estudio de la Vegetación*; Monografía 22; Secretaría General de la Organización de los Estados Americanos: Washington, DC, USA, 1982; pp. 33–54.
54. Artigas, R.C.; Del Olmo, F.D. Muestreo en transecto de formaciones vegetales de fanerófitos y caméfitos (I): Fundamentos metodológicos. *Estud. Geogr.* **2013**, *74*, 67–88. [CrossRef]
55. Valdez, M.C.G.; Guzmán, L.M.A.; Valdés, G.A.; Forougbakhch, P.R.; Alvarado, V.M.A.; Rocha, E.A. Estructura y diversidad de la vegetación en un matorral espinoso prístino de Tamaulipas, México. *Rev. Biol. Trop.* **2018**, *66*, 1674–1682.
56. Canizales, P.A.; Alanís, E.; García, S.A.; Holguín, V.A.; Collantes, A. Estructura y diversidad arbórea de un bosque de galería urbano en el río Camachito, Noreste de México. *Polibotánica* **2021**, *51*, 91–105.
57. Rial, A. Spatial-Temporal variability of aquatic plant communities in the Venezuelan Llanos. *Rev. Biol. Trop.* **2006**, *54*, 403–413.
58. Lancia, R.H.; Kendall, W.L.; Pollock, H.K.; Nichols, J.M. Estimating the number of animals in wildlife populations. In *Research and Management Techniques for the Wildlife and Habitats*; The Wildlife Society: Bethesda, MD, USA, 1996; pp. 215–253.
59. Davis, D.E.; Winstead, R.L. Estimación de tamaños de poblaciones de vida silvestre. In *Manual de Técnicas de Gestión de Vida Silvestre*, 3rd ed.; The Widlife Society: Bethesda, MD, USA, 1987; pp. 233–258.
60. Kloskowski, J.; Green, A.J.; Polak, M.; Bustamante, J.; Krogulec, J. Complementary use of natural and artificial wetlands by waterbirds wintering in Doñana, south-west Spain. *Aquat. Conserv. Mar. Freshw. Ecosyst.* **2009**, *19*, 815–826. [CrossRef]
61. Braun, C.E.; Harmon, K.W.; Jackson, J.A.; Littlefield, C.D. Management of National Wildlife Refuges in the United States: Its impacts on birds. *Wilson Bull.* **1978**, *90*, 309–321.
62. Riojas-López, M.E.; Mellink, E. Potential for biological conservation in man-modified semiarid habitats in northeastern Jalisco, Mexico. *Biodivers. Conserv.* **2005**, *14*, 2251–2263. [CrossRef]
63. Bethke, R.W.; Nudds, T.D. Effects of climate change and land use on duck abundance in Canadian prairie-parklands. *Ecol. Appl.* **1995**, *5*, 588–600. [CrossRef]
64. Manley, S.W.; Kaminski, R.M.; Reinecke, K.J.; Gerard, P.D. Agronomic implications of waterfowl management in Mississippi ricefields. *Wildl. Soc. Bull.* **2005**, *33*, 981–992. [CrossRef]
65. Hubbart, J.P. *The Biological and Taxonomic Status of the Mexican Duck*; Department of Game & Fish: Albuquerque, NM, USA, 1977; pp. 6–56.
66. Elmberg, J.; Nummi, P.; Poysa, H.; Sjoberg, K. Factors affecting species number and density of dabbling duck guilds in North Europe. *Ecography* **1993**, *16*, 251–260. [CrossRef]
67. Butler, R.W.; Taylor, W. A review of climate change impacts on birds. *Proc. Int. Ornithol. Congr.* **2005**, *19*, 1747–1758.
68. Szalay, F.A.; Resh, V.H. Factors influencing macroinvertebrate colonization of seasonal wetlands: Responses to emergent plant cover. *Freshwater Biol.* **2000**, *45*, 295–308. [CrossRef]
69. Marklund, O.; Sandsten, H.; Hansson, L.A.; Blindow, I. Effects of waterfowl and fish on submerged vegetation and macroinvertebrates. *Freshw. Biol.* **2002**, *47*, 2049–2059. [CrossRef]
70. McMaster, D.G.; Devries, H.J.; Davis, S.K. Grassland birds nesting in haylands of southern Saskatchewan: Landscape influences and conservation priorities. *J. Wildl. Manag.* **2005**, *69*, 211–221. [CrossRef]
71. Rorabaugth, J.C.; Zwank, P.J. *Habitat Suitability Index Models: Mottled Duck*; FWS/OBS-82/10. 52; U.S. Fish and Wildlife Service: Washington, DC, USA, 1983; pp. 1–26.