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# **ARTICLES**

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# BIOGEOGRAPHIC DESCRIPTION AND EVALUATION OF THE BIRD POPULATION OF CHILEAN PATAGONIA

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Chilean Patagonia is a vast area containing regions 9 to 4, situated in the south of the country, sharing a border with Argentina. The most significant geographic factor conditioning the features of the region is the latitude, given that it is situated between 36° and nearly 56° of latitude south. The northern limit is established by the river Maule, which flows from the foothills of the Andes towards the Pacific Ocean and the river Colorado, which rises in the same area as the Maule, but flows towards the east to the Atlantic Ocean. The southern limit is at the southernmost isles and Cape Horn. To the east it borders on Argentina and to the west the limit is the Pacific Ocean. The extension of Patagonia (Chile+Argentina) is about 1,140,000 km<sup>2</sup>, although the area of Chilean Patagonia is 407,144.8 km<sup>2</sup>.

The environmental conditions are heavily influenced by certain factors. First, the location more or less to the south will affect the temperatures, varying from moderate to extreme. The second influencing factor for the climate, and therefore for the bird population community too, is the cold ocean currents (Humboldt and Antarctic Streams). Due to this ocean influence the precipitations also vary considerably. Geologically speaking, the primary basement can explain the geological function and evolution of this part of Chile. To a great extent, there is strong structural control that depends on the horsts and grabens defined by a complex and extensive network of interleaving fractures that make abrupt the Patagonian landscape. Nowadays, the Andes range is still moving and provoking a certain amount of seismic activity, which, coupled with the presence of an intricate network of faults, has given rise to the appearance of important volcanic phenomena and a very compartmentalized relief. Geomorphologically, the importance of permanent ice, both currently and in the past, should be highlighted as an influential factor. The presence of permanent ice determines a large number of morphologies such as artesian valleys, fiords, moraines, cirques, etc. There is also a great abundance of freshwater or saltwater lakes, tarns and, in general, waterlogged

areas generated through the action of ice. This extensive area of flooded land, in addition to land with poor drainage and land where permafrost exists at a certain depth, will significantly influence the appearance of a large number of aquatic species, fundamentally anatinidae, which are closely associated with this type of environment.

As well as these issues, long-term human activity in the area should also be taken into account. Although ethnic groups such as the Onas, Yaganes, Alacalufes, Chonos, Tehuelches, Cuncos, Mapuches, etc. inhabited these areas since more than 10,000 years ago, it was not until well into the nineteenth century that the most drastic changes were produced derived from intensive occupation of the land. Human activity has affected several aspects; however, animal farming has led to the greatest changes in the landscape. In comparison agriculture is scarcely relevant, logically this becomes even less going south. Other industries such as fishing and exploitation of natural resources, for example petroleum, have complemented the economic activities, but due to the large number forests, timber exploitation has provided one of the most profitable activities. Timber production and the opening of spaces for pasture have therefore been responsible for a notable loss in forested areas, in such a way that zones which used to be dominated by the Valdivian or Magellanic forest are now areas showing different stages of substitution, consisting of pastures and scrubland.

The main aim of this article is to describe the bird population that inhabit this particular area, assessing through comparison with other more extensive areas.

The evaluation is based on two basic criteria:

- Species diversity.
- The level of threat of extinction or conservation of the distinct species.

The assessment was carried out bearing in mind the large environmental units in which each species lives. The general criterion for estimating or excluding a species was its presence, both in a general area and in each one of the environmental areas, in favorable seasons for nesting and breeding (EOAC Methodology: *European Ornithological Atlas Committee*).

Moreover, the human impact on the bird population is evaluated taking into account those species that, although aliens, were introduced in different ways, through more or less accidental release of individuals brought from other regions or continents.

The study was carried out during a research visit in collaboration with Doctor Víctor Quintanilla and the University of Santiago (Chile) and the Catholic University of Chile. The visit took place during January and February 2005 and took advantage of the middle of the southern summer and, therefore, the optimum reproduction and breeding season of the largest possible number of species, as well as the period of maximum activity. The results can only be assessed in a qualitative way. The methodological system was the classical one, taking into account repeated bird sounds, deployment of distinct types of transept, visits to sensitive zones, interpretation of traces and prints, etc.

Field observations were contrasted and extended with a close consultation with diverse sources, databases, references, etc. We would like to express our gratitude for the aid given with all the information; references, databases, atlas, etc. provided by CONAF.

Next we will succinctly describe the environments or habitats considered for the description and evaluation of the birds:

1. Valdivian temperate forest: this Patagonian eco-region is located in the most northerly sector. This large unit covers a thin continental strip, between the western slopes of the Andes and the ocean coast, extending from 35° to 46° south. It should be taken into account that towards the east at this latitude it is limited by the appearance of perpetual snow above 1,500-1,800 m. In this area the precipitations vary between 1,000 mm/year on average at the north and more than 6,000 mm/year in the most southerly part of the eco-region. The rains are seasonal, concentrated mainly in the southern summer (December, January and February). Nevertheless, within the aforementioned biome forest there are significantly different types of forestation, in many cases, dotted in relatively small land areas. The most important are: deciduous forest in the Maule province; Valdivian laurel forest; North-Patagonian forest; Andean-Patagonian forest, and evergreen forests. Moreover, human influence has made the open spaces and areas in stages of substitution more abundant than the forested areas.

2. Magellanic forest: is defined as sub-Antarctic forest where the dominant genus is *Nothofagus*. The unit where it can be found covers the western strip of the southern end of South America and it extends along the Patagonian Andes and the Chilean fiords. It can be delimited between 46° south and Cape Horn. It is characterized by the existence of a temperate-cold and wet climate, which becomes very cold as altitude increases. The strong western winds are found all year round and they are responsible for the existence of the much heavier precipitations on the western than eastern slopes of the Andes. As for the different types of forests that can be found in this unit, two large categories can be distinguished: perennial forest of Magallanes coihue, *Nothofagus betuloides* and deciduous forest of lenga, *Nothofagus pumilio* and nire, *Nothofagus antarctica*. In this unit the species introduced by human activity can also be highlighted for their great extension.

3. The Patagonian steppes are characterized by vegetation that is extremely scarce and resistant to the hard environmental conditions typical in this eco-region. Although this type of land is more present and more clearly represented in Argentina, the steppes also appear in Chile, specifically in the large Andean Massifs. The climate is typified by its extreme nature. The low temperatures should be remarked, above all in winter months; June, July and August, with average temperatures that go below 2° C and extreme values of 20 or 25° below zero to which the dryness of the environment has to be added.

4. Andean Range: This unit varies in altitude, being lower in Tierra de Fuego and getting higher at lower latitudes, in such a way that it appears in Torres del Paine at above 1,500 metres, in Cerro Murallón at above 1,800 metres and in Fitz Roy at above 2,000 metres. In general, above these altitudes the conditions are quite extreme, such that there are very cold registers and atmospheric conditions are relatively dry although these temperatures make the evaporation or loss of water very low. Nevertheless, depending on the altitude and the conditions, several sub-units can be distinguished: pre-Andean scrubland; Andean desert; cliffs and rock outcrops and zones of glaciers and perpetual snow.

5. Coasts, fiords and marshy zones: this includes a great deal of Patagonia and a wide variety of conditions, characteristics and sub-units. Four different types can be differentiated: high coasts or cliffs; low sandy coasts; marshy zones and rocky coasts.

6. Lakes, lagoons, tarns, wetlands and fluvial systems: Patagonia has innumerable continental wet zones. Additionally, the fluvial streams are of special interest as a consequence of the large amount of water from melt-waters from the glaciers and ice fields during the southern summer, the high levels of precipitations in specific sectors and the steep slopes, often between 3,000 and 4,000 metres in only 100Km from the peaks to sea level.

7. Lastly, the Magellanic Tundra is mainly located in the most southerly zones closest to the sea. Normally it forms a coastal strip that, in these places, has an exceptionally hard climate, with low temperatures both in the winter and the southern summer and facing the brunt of the west winds.

The analysis of the distribution of the distinct bird species within Chilean Patagonia leads to the following conclusions:

There is equilibrium between the land surface and the number of taxons, in such a way that in a little over half of Chile (53.79%), one can find half of the bird species (52.19%).

Chilean Patagonia does not contain the most diverse habitats: mainly open Mediterranean forest, Mediterranean scrubland and other mountainous and desert land types; given that these types are present in other sectors of the central regions of the country.

However, the Patagonia region (Chile+Argentina) shows a different situation. In this case the differences are very notable, in fact in a little more than a third of the land area (35.71%), the part belonging to Chile contains more than three quarters of the taxons existing in the whole region (79.07%).

Chilean Patagonia has a greater diversity of environments and large habitats than Argentinean Patagonia and, as a consequence, has a greater diversity of bird population taxons.

Within Patagonia in general, and particularly in Chile, there is a predominance of aquatic species over land dwelling species: 155/134 and 128/110 respectively.

Hierarchically, taking into account the species diversity from the most to the least, next we list the environmental units indicating between brackets the number of taxons they contain: Coasts (125), Lakes; Wetlands and Rivers (90), Valdivian Temperate forests (73), Patagonian steppes (63), Patagonian forests (62), Andes Mountains (41) and Patagonian Tundra (40).

Chilean Patagonia has 41 species included in the UICN lists, and therefore, under some type of danger, while there are 73 in Chile as a whole. In other words, 56.16% of all those species catalogued. This means that Chilean Patagonia has a notable strategic value as it contains a large number of the species in danger of extinction.

Chilean Patagonia has 100% of the species appearing in the UICN lists within Patagonia. There is also a priority of Chilean Patagonia over Argentinean Patagonia for the endangered species.

While there are only 17 endemic species exclusive to Chile, there are 48 in Patagonia as a whole of which 38 appear in Chilean Patagonia. Only three of these endemic species are exclusively present in Chilean Patagonia and not in Argentinean Patagonia.

Hierarchically, taking into account the number of endemic taxons, next we list the environmental units from greater to smaller: Valdivian Temperate forest (18), Coasts (14), Patagonian steppes (13), Patagonian forest (12), Andes Mountains (10), Lakes; wetlands and Rivers (9) and Patagonian Tundra (6).

Not too many species have been introduced into Chilean Patagonia: only 9, and of those, up to now, only the Domestic Pigeon (*Columba livia*) and the Common Sparrow (*Passer domesticus*) can be considered as plague species. Furthermore, they are both closely associated with lower quality, more human-affected environments.

