

## Sixth International Simultaneous Census of three flamingo species in the Southern Cone of South America: Preliminary analysis

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### Abstract

The sixth International Simultaneous Census (ISC) of High Andean Flamingos carried out during the summer of 2020 covered 551 wetlands in Argentina, Bolivia, Chile and Peru. A total of 795,551 individuals of the three flamingo species were recorded: 77,949 Andean flamingos (*Phoenicoparrus andinus*), 154,001 puna flamingos (*P. jamesi*), and 515,530 Chilean flamingos (*Phoenicopterus chilensis*). We observed a sustained increasing trend in the global abundances of the three flamingo species. The known sites that concentrate high Andean flamingos in summer were reaffirmed, highlighting the area centered on the tripartite border of Argentina, Bolivia, and Chile. By significantly expanding census coverage compared to previous years, progress was made in the identification of sites of importance for the conservation of Chilean flamingos.

## Resumen

El VI Censo Simultáneo Internacional (CSI) de Flamencos Altoandinos del verano 2020 alcanzó una notable cobertura de 551 humedales en Argentina, Bolivia, Chile y Perú. Se registró un total de 795.551 individuos de las tres especies de flamenco, 77.949 *Phoenicoparrus andinus*, 154.001 *P. jamesi* y 515.530 *Phoenicopterus chilensis*. Se observa una tendencia global sostenida de aumento en la abundancia de las tres especies. Se reafirmó los sitios de concentración estival conocidos para flamencos altoandinos, destacando el área tripartita de Argentina, Bolivia y Chile, y se avanzó en la identificación de sitios de importancia para la conservación de flamenco austral al ampliar la cobertura censal.

## Résumé

Le sixième recensement international simultané (RIS) des flamants des hautes Andes, réalisé au cours de l'été 2020, a couvert 551 zones humides en Argentine, en Bolivie, au Chili et au Pérou. Un total de 795 551 individus des trois espèces de flamants a été dénombré : 77 949 flamants des Andes (*Phoenicoparrus andinus*), 154 001 flamants de James (*P. jamesi*) et 515 530 flamants du Chili (*Phoenicopterus chilensis*). Nous avons observé une tendance à la hausse soutenue de l'abondances globale des trois espèces de flamants. Les sites connus qui concentrent les flamants des Andes en été ont été confirmés, soulignant l'importance de la zone centrée sur la frontière tripartite entre l'Argentine, la Bolivie et le Chili. En élargissant considérablement la couverture du recensement par rapport aux années précédentes, des progrès ont été accomplis dans l'identification des sites importants pour la conservation des flamants chiliens.

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## Introduction

The Grupo Conservación Flamencos Altoandinos (GCFA) began its international activities in 1996 with simultaneous censuses of the two High Andean Flamingo species, the Andean flamingo (*Phoenicoparrus andinus*) and puna flamingo (*P. jamesi*) throughout their range in Argentina, Bolivia, Chile, and Peru. To date, six international summer censuses of broad coverage have been carried out in 1997, 1998, 2005, 2010, 2015, and 2020, and two winter censuses in 1998 and 2000. The early censuses from 1997 to 2000 allowed the GCFA to establish baseline population numbers for both species of High Andean Flamingos, as well as the conservation status of their habitats (Caziani et al., 2007). The GCFA defined a five-year census frequency to monitor population trends of both species. The third simultaneous census (2005) provided the necessary scientific information to identify priority wetlands and design a Network of Wetlands of Importance

for the Conservation of High Andean Flamingos (Marconi et al., 2007). Starting in 2010, lowland wetlands were incorporated into the summer censuses (Marconi et al., 2011), resulting in greater coverage of the Chilean flamingo's range (Romano et al., 2011). Here we report on the results of the sixth International Simultaneous Census of flamingos carried out in 2020 (ISC20) and compare it with the results of 2005, 2010, and 2015 censuses.

## Methods

The ISC20 was carried out by 190 participants including biologists, technicians, and park rangers, with the support of 33 organisations including national and international governmental organizations, academic and non-governmental organizations, and private sector companies. Census team leaders and country coordinators planned and coordinated the ISC20 through virtual meetings.

In Argentina, Bolivia, and Peru the census was carried out from 1<sup>st</sup> to 10<sup>th</sup> February 2020, the dates that had been established previously for this activity. In Chile, the census was carried out from 21<sup>st</sup> to 24<sup>th</sup> January 2020, due to climatic conditions that strongly affect regions in northern Chile.

In conjunction with the flamingo ISC, teams also carried out the First Simultaneous Census of shorebirds in the Altiplano, with special emphasis on Neotropical migratory birds, and in particular the Wilson’s phalarope (*Phalaropus tricolor*). This census was coordinated by the Western Hemisphere Shorebird Reserves Network (WHSRN), a program of Manomet, and the GCFA. The information obtained during the shorebird census will contribute to the development of the Midcontinent Americas Shorebird Conservation Initiative (Castellino &

Lesterhuis, 2020), fostering collaboration and building synergies for conservation strategies for flamingo and shorebird habitats in the Altiplano.

The results of these censuses were complemented by flamingo census data provided by several researchers carrying out the Summer Neotropical Waterbird Census and the Lowland Phalarope Census in Argentina, coordinated by the WHSRN.

For the flamingo census, the GCFA census protocol was used (Marconi, 2010). In this report we used data on adults, sub-adults, and juveniles of the three flamingo species for population estimates. All census teams contributed their data of wetlands surveyed and flamingo abundances to the GCFA shared database.

## Results

### Wetlands censused in ISC20

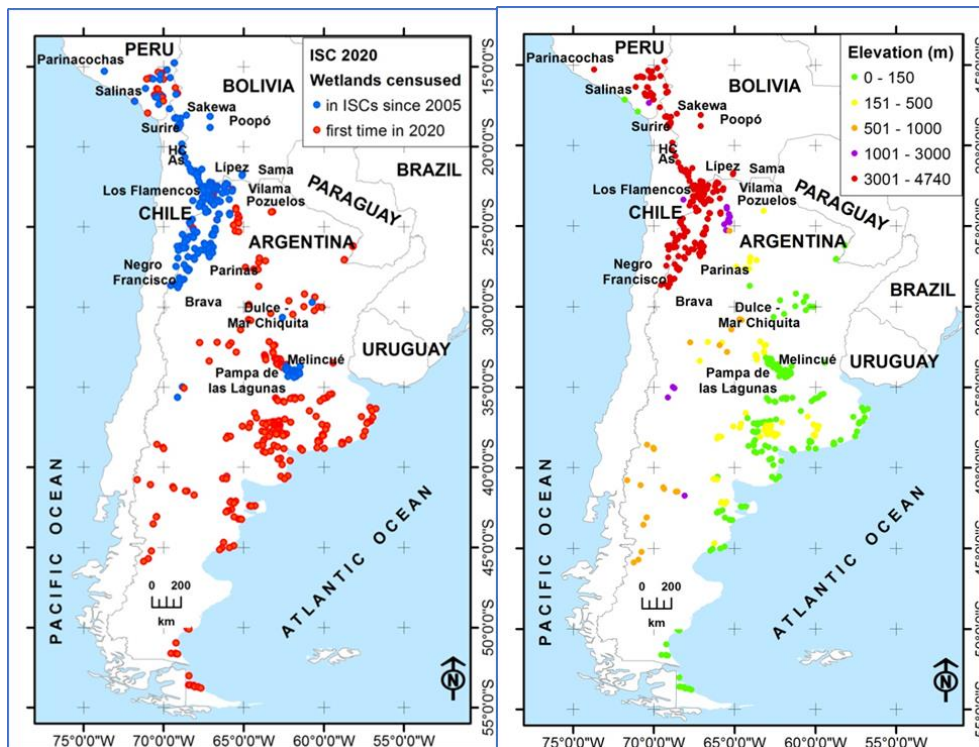


Figure 1: Maps of wetlands censused in ISC20: Left map: Blue dots are wetlands censused up until 2015; red dots are wetlands incorporated into the census in 2020; Right map: Colour dots indicate wetlands in different elevation ranges.

During the ISC20, 551 wetlands were censused in Argentina, Bolivia, Chile and Peru (Figure 1), including lakes, lagoons, salinas, salt flats, bogs, rivers, marshes, marine coastline, spanning an altitude range from 0-4740 m.a.s.l., of which 29% (160 wetlands) are

included in the 22 priority sites of the Network of Wetlands of Importance for the Conservation of High Andean Flamingos (Figure 2).

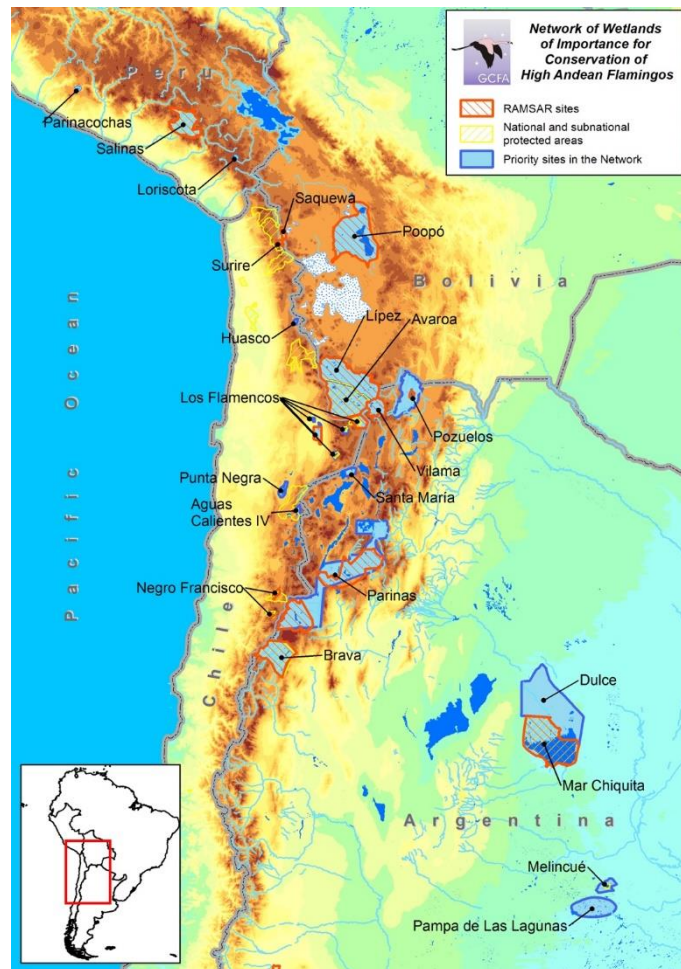


Figure 2: Network of Wetlands of Importance for the Conservation of High Andean Flamingos, indicating the 22 priority sites identified.

The ISC20 was the census with the broadest coverage organized by the GCFA and included the entire known distribution range of the Andean and puna flamingos, and most of the range of the Chilean flamingo, expanding wetland coverage by 55% and incorporating for the first time wetlands of the Patagonia region in southern Argentina (62 wetlands).

Overall results

Global results obtained during the ISC20 for the three flamingo species are summarised in

Table 1. Unidentified individuals correspond almost exclusively to two wetlands, Laguna de los Pozuelos (39,201) in Argentina, and Salar de Surire (8,400) in Chile. In Laguna de los Pozuelos, the difficulty in identifying species is due to the large size of the wetland and the distance between the observers and the flamingos (Moschione & Sureda, 2008, Rodríguez et al. 2011). In the Salar de Surire, the census team consisted of one individual whose optical equipment could not distinguish species from a distance.

Table 1: Global results of the International Simultaneous Census (ISC) of the three flamingo species in the Southern Cone of South America from 1997-2020.

	ISC97	ISC98	ISC05	ISC10	ISC15	ISC20
Puna flamingo	47,619	64,101	105,647	106,001	159,946	<b>154,001</b>
Andean flamingo	33,918	27,813	31,962	38,675	57,821	<b>77,949</b>
Chilean flamingo	39,087	25,777	40,889	282,752	267,627	<b>515,530</b>
Flamingo species unidentifiable	0	0	26,547	8,623	2,783	<b>48,071</b>
Total	120,624	117,691	205,045	436,297	485,394	<b>795,551</b>
Wetlands censused	94	125	140	259*	244**	<b>551***</b>
Wetlands with High Andean Flamingos	69 (73%)	90 (72%)	117 (84%)	157 (61%)	127 (52%)	<b>142 (26%)</b>
Wetlands with flamingos	82 (87%)	108 (86%)	121 (86%)	193 (75%)	180 (74%)	<b>287 (52%)</b>

\* Includes 26 lowland wetlands  
 \*\* Includes 52 lowland wetlands  
 \*\*\* Includes 228 lowland wetlands

When comparing censuses with similar coverage -ISC05, ISC10, ISC15, and ISC20- including all wetlands surveyed, we observe a constant increase in the two High Andean Flamingo species until 2015 (Figure 3). In 2020, Andean flamingo numbers increased by 26% compared to 2015, while puna flamingo numbers remained stable. When considering only the same wetlands censused in those

four ISCs (n= 68), we observe a sustained increasing trend for both High Andean Flamingo species over the last 15 years (Figure 3). However, the high number of unidentified individuals in 2020 introduces a bias in this comparison. In the ISC20, the increase in Chilean flamingo numbers is notable.

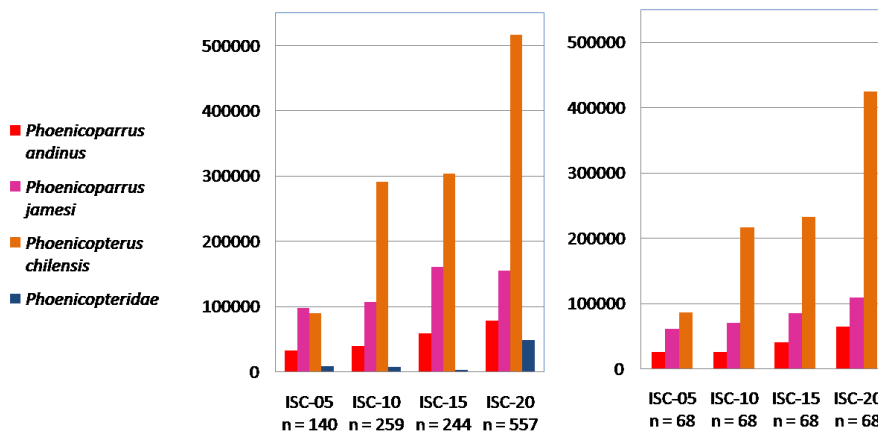


Figure 3: (left) Total flamingo abundances by species in ISCs with broad coverage. (right) Flamingo abundances by species in the subset of wetlands surveyed in the four censuses.

Spatial distribution of the three flamingo species in CSI20

Half of the global population of puna flamingos is concentrated in five high Andean wetlands (Figure 4): Lagunas Colorada (17.6%) and Khara (7%) in Bolivia, Laguna Grande (11%) and Laguna Vilama (10.5 %) in Argentina, and Salar de Tara in Chile (5%). The Andean flamingo presents a similar distribution pattern (Figure 4), with 50% of the

population in four wetlands: Laguna de los Pozuelos (18%) and Laguna Palar (16%) in Argentina, and Laguna Colorada (10%) and Lago Uru-Uru (8%) in Bolivia. In the lowlands, only one priority site, Mar Chiquita, contributed to the high Andean flamingo count with 67 puna flamingos and 817 Andean flamingos.

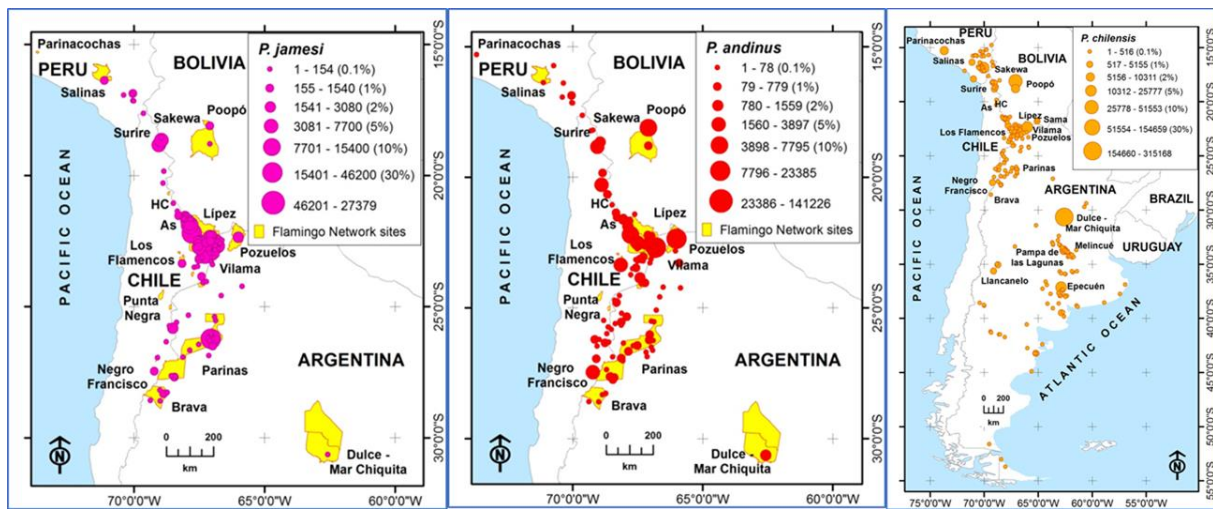


Figure 4: Maps of distribution and abundance by species: Puna flamingo (left), Andean flamingo (middle), Chilean flamingo (right).

Both High Andean Flamingo species had distribution patterns similar to the previous ISCs (Caziani et al., 2006; Caziani et al., 2007; Marconi et al., 2011; Marconi et al., 2015). The sites with higher puna flamingo abundance in summer (76% of the global population) are concentrated in three areas. The largest includes the priority sites of the region around the tripartite area: Laguna Vilama and Laguna de los Pozuelos, Argentina, Reserva Eduardo Avaroa and Los Lipez, Bolivia, and Reserva Nacional Los Flamencos National Reserve (Salar de Tara), Chile. Adding two other areas, Laguna Grande (within the Parinas priority site), Argentina, and Surire-Sakewa, Bolivia, these three areas encompass 93% of the total puna flamingo population.

The distribution pattern is somewhat less aggregated for the Andean flamingo. The sites

in the tripartite area, Laguna Vilama, Laguna de los Pozuelos, Reserva Eduardo Avaroa, Los Lipez, and and Reserva Nacional Los Flamencos (Salar de Atacama), comprise 69% of the population. Sites to the north of the tripartite area, Lago Poopó (8.45%) and Surire-Sakewa (5.75%), and Salar Huasco-Coposa (3.64%) and Laguna Negro Francisco (4.48%) to the south have intermediate abundances, between 1,000 and 3,000 individuals.

The Chilean flamingo shows a different distribution pattern, with highest abundances (81%) found in lowland wetlands such as Mar Chiquita-Dulce, Lago Epecuén (Buenos Aires Province, Argentina), Loriscota and Parinacochas (Peru), Nueva Las Tunas (Córdoba Province, Argentina), Laguna Jara (Chubut Province, Argentina), Nihuil Reservoir (Mendoza Province, Argentina) and in two wetlands in the high Andes: Laguna de los

Pozuelos and Lago Poopó-Uru Uru, Bolivia (10.74%), Figure 4. In 2020, high numbers of Chilean flamingos stand out in Laguna Palar

(9.27%) of the Laguna Vilama complex, with a high proportion of juveniles (> 50%).

Flamingo abundances by country

When analysing the ISC20 data for the puna flamingo by country (Figure 5), we observed a decrease in numbers in Bolivia compared to 2015, accompanied by an increase in Argentina. In the case of the Andean flamingo (Figure 5) numbers fluctuate in Chile, but we observe an increase overall in Bolivia and in Argentina (where numbers have doubled compared to the 2015 Argentinian

population). Most of the Chilean flamingo population was found in Argentina throughout all of the censuses, with a notable increase in ISC20 (Figure 5). This increase in 2020 is also observed in Bolivia and Peru, while in Chile, numbers in the censused areas are the lowest for this species. Part of the global increase recorded in 2020 (5%) is due to the increase in coverage of that census. Lowland wetlands were not included in ISC05; these were incorporated into the ISC in 2010.

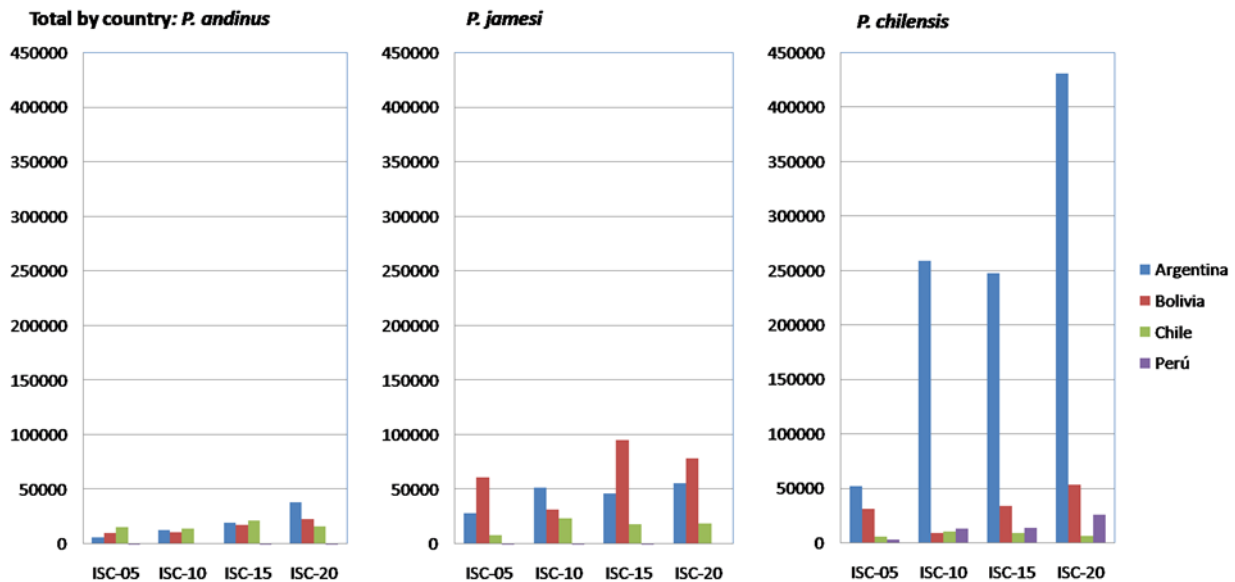


Figure 5: ISC results by country for Andean flamingo (left), puna flamingo (middle) and Chilean flamingo (right).

**Discussion**

The ISC in the summer of 2020 was the flamingo census with the broadest coverage to date, with 551 wetlands surveyed in Argentina, Bolivia, Chile, and Peru. The addition of new lowland wetlands did not expand coverage of the High Andean Flamingo species' range, but did so for the Chilean flamingo, especially in Argentina where wetlands in the centre and southern regions of the country were added (Figure 1).

The ISC20 incorporated 304 new wetlands, 281 in Argentina and 23 in Peru, resulting in a 5% increase (25,141 individuals) in the abundance of Chilean flamingos counted. No new wetlands were incorporated in Bolivia or Chile. We aim to increase the census coverage for the Chilean flamingo in Chile because of known records in the south of the country. These preliminary results have important implications in prioritising conservation efforts for the Chilean flamingo and in defining a Network of Wetlands of Importance for the Conservation of Flamingos that

considers the three flamingo species in the Southern Cone.

Comparing the censuses with similar coverage-ISC05, ISC10, ISC15, ISC20- and including the same wetlands surveyed in these four ISCs (n= 68), a sustained increasing trend in global abundances of both species of High Andean Flamingo species is detected over the past 15 years. In ISC20, a notable increase in Chilean Flamingos was recorded (Figure 3).

When analysing the ISC20 data for the puna flamingo by country (Figure 5), we observed a decrease in Bolivia compared to 2015, accompanied by an increase in Argentina. This trend was even more dramatic in ISC10 (Marconi et al., 2011) and reinforces the evidence for complementary use of wetlands and the relevance of the regional and transboundary approaches in the analysis of census data and conservation strategies for these species which are concentrated in the tripartite border area of Argentina, Bolivia, and Chile.

The next steps identified with respect to the conservation of High Andean Flamingos include reviewing the list of priority sites and defining the incorporation of new sites based on the inclusion criteria used to define the Network of Priority Wetlands (Marconi et al., 2007). We are also considering using a category of “priority site in recovery” for those wetlands or wetland complexes that, based on the results of the ISC20, do not meet the inclusion criteria defined for the Network, but require special management and conservation programs or ecological restoration actions. We are also going to evaluate the current degree of implementation of the Network of Wetlands of Importance for the Conservation of High Andean Flamingos, through an analysis of the conservation status of each Network site.

## Conclusions

Our data show a sustained increasing trend in the global abundances of these three flamingo

species. The known sites that concentrate High Andean flamingos in summer were reaffirmed, highlighting the area centered on the tripartite border of Argentina, Bolivia, and Chile. By significantly expanding census coverage in 2020, progress was made in identifying sites of importance for the conservation of Chilean flamingos. The priority sites for the conservation of the Chilean flamingo should be identified applying the same criteria as those used for the Network for High Andean Flamingos, a conservation strategy for the species should be developed, and conservation strategies among the three flamingo species should be compatible.

Finally, we propose to strengthen links among the organisations participating in the ISC20, enhance their capacities, and design a joint monitoring plan for flamingos and other aquatic birds.

## Acknowledgements

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