Fourth simultaneous flamingo census in South America: preliminary results

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Abstract — The fourth International Simultaneous Census (ISC) of flamingos in South America, conducted in 2010, included a comprehensive survey of 259 wetlands throughout the distribution range of both of the high Andes species, the Andean *Phoenicoparrus andinus* and Puna Flamingo *P. jamesi*, in Argentina, Bolivia, Chile and Peru. At each wetland we recorded total flamingo counts, other waterbird species counts, resightings of banded flamingos, and we surveyed breeding sites. Total counts were 106,001 Puna Flamingos, 38,675 Andean Flamingos, 280,752 Chilean Flamingos *Phoenicopterus chilensis*, and 8,623 unidentified flamingos. Comparing censuses of similar coverage (ISC 05 and ISC 10), numbers of Andean and Puna Flamingos are similar. In contrast, there was a marked increase in Chilean Flamingos with the inclusion of lowland wetlands, especially Mar Chiquita-Bañados del Río Dulce and Laguna Llancanelo in ISC 2010. Both high-Andes flamingo species had similar distribution to prior censuses.

Resumen — El 4to. Censo Simultáneo internacional (CSI) en 2010 incluyó un relevamiento exhaustivo de 259 humedales a través del área de distribución de las dos especies de Flamencos Altoandinos, la Parina Grande (*Phoenicoparrus andinus*) y la Parina Chica (*P. jamesi*) en Argentina, Bolivia, Chile y Perú. En todos los humedales registramos conteos totales de flamencos y de aves acuáticas, re-avistaje de individuos anillados e hicimos un relevamiento de sitios de nidificación. Los resultados totales fueron 106.001 Parinas Chicas 38.675, Parinas Grandes, 280.752 Flamencos Australes (*Phoenicopterus chilensis*), y 8.623 flamencos no identificados. Comparando censos de similar cobertura (CSI 2005 y CSI 2010), los números de Parinas Grandes y Parinas Chicas son similares. En cambio, hubo un marcado incremento del número de Flamencos Australes, debido a la inclusión en el CSI 2010 de humedales de Tierras Bajas, especialmente Mar Chiquita - Bañados del Río Dulce y Laguna Llancanelo. Ambas especies de Flamencos Altoandinos tuvieron similar patrón de distribución que en censos anteriores.

Keywords: Andean Flamingo, Phoenicoparrus andinus*, Puna Flamingo,* Phoenicoparrus jamesi*, Chilean Flamingo,* Phoenicopterus chilensis*, census, high Andes, International Simultaneous Census, ISC, Argentina, Bolivia, Chile, Peru, Grupo Conservación Flamencos Altoandinos, GCFA.*

Introduction

Range-wide simultaneous censuses for high Andes flamingos started in 1997 and were the first regional activity developed by the Grupo Conservación Flamencos Altoandinos (GCFA). Three international (comprehensive) summer censuses (1997, 1998, 2005) and two winter censuses (1998, 2000) have been conducted to date. The first series of simultaneous censuses (1997–2000) allowed the GCFA to establish a regional baseline for population numbers for both high Andean flamingo species and the conservation status of Andean wetlands. The GCFA determined that simultaneous censuses at 5-year intervals would allow establishment of population trends for the two high Andes flamingo species. The third summer census (2005) provided the necessary scientific information to identify priority wetlands for development of a Network of Wetlands of Importance for Flamingo Conservation, focusing research and conservation efforts on these key sites. Here we report preliminary results from the fourth simultaneous flamingo census carried out in 2010.

Logistics and methodology

During the 2010 simultaneous flamingo census, we visited 259 wetlands in January and February in Argentina, Bolivia, Chile and Perú, of which 60% are included in the Network of Wetlands of Importance for Flamingo Conservation (Figure 1) (Marconi 2010). Of all censuses organized by the GCFA, this one had the broadest wetland coverage, increasing number of wetlands censused by 62% and including lowland wetlands (29 lakes).

Eighty-eight people participated including biologists, park guards, and students distributed in 21 census teams. Twenty institutions including government agencies, academic institutions, national and international non-governmental organizations, and two private companies provided support or participated either directly or indirectly.

To train new technicians and plan and coordinate the 2010 Census, we held the "Training Workshop for Integrated Management of the High Andes Wetland Network and Associated Ecosystems of Argentina, Bolivia, Chile and Peru," funded by the Ramsar Convention (Ramsar, 1971) and the Wetlands for the Future Initiative. The workshop took place from 8–13 November, 2009, in Abra Pampa, Jujuy Province, Argentina, organized by Patricia Marconi with support from Fundación YUCHÁN and technical staff of the National Park Administration's (Administración de Parques Nationales, APN) Northwestern Regional Delegation and Laguna de los Pozuelos National Monument. Field training activities took place in Laguna Runtuyoc and Laguna de los Pozuelos Natural Monument. The latter is the first Ramsar site for Argentina and a priority site in the Wetland Network.

Concurrent to the workshop, the GCFA met to plan and coordinate the 2010 International Simultaneous Census (ISC 10). Outcomes were: 1) updated consensus version of the 2010 census methodology; 2) detailed workplan with census dates established, 20 operative units organized, and country

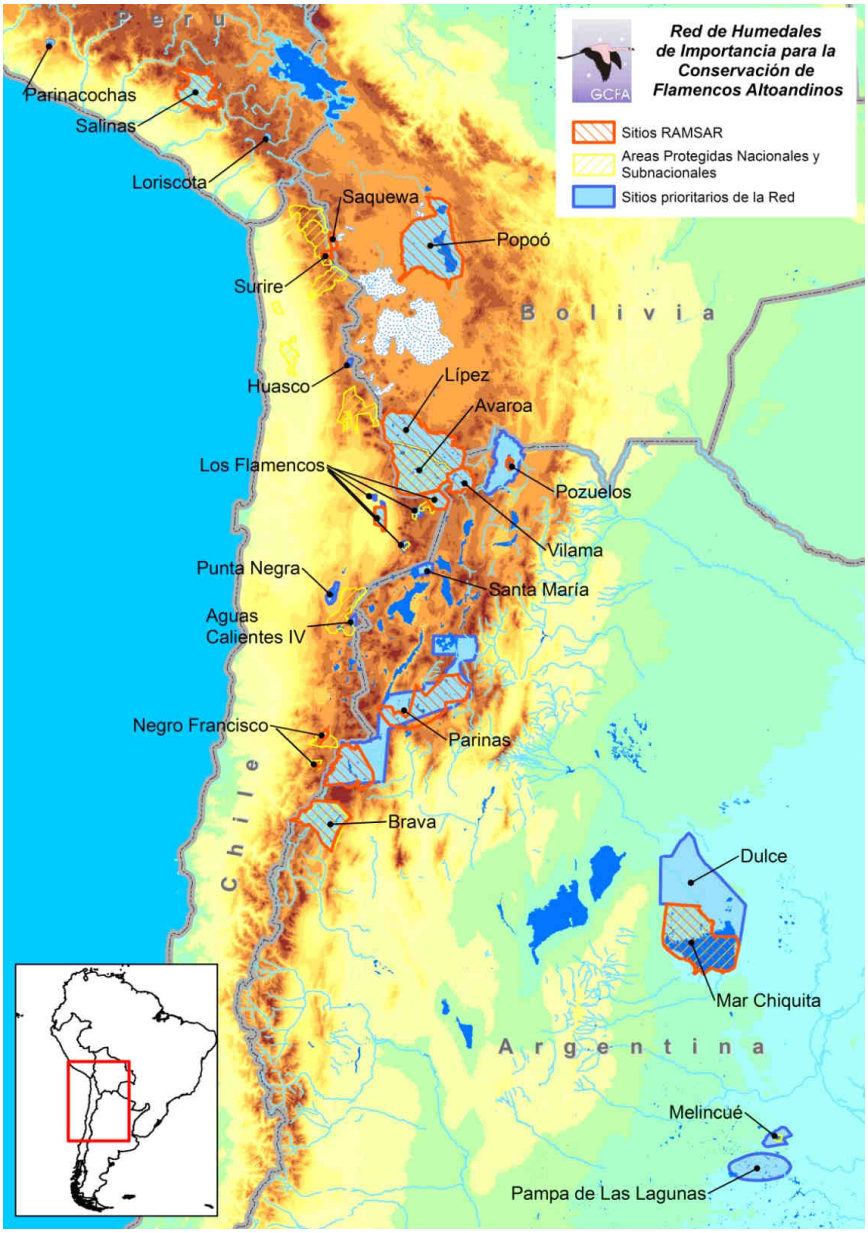

Figure 1. Network of Wetlands of Importance for Flamingo Conservation.

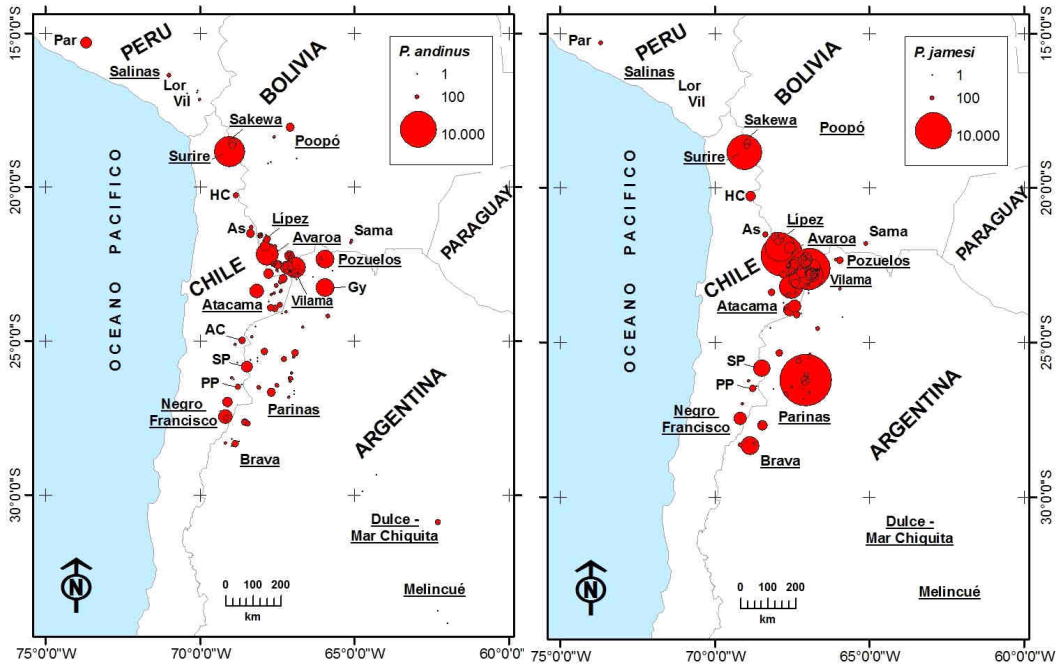

Figure 2. Andean Flamingo *Phoenicoparrus andinus* and Puna Flamingo *P. jamesi* abundance at each wetland during the fourth International Simultaneous Census, January–February 2010. Underlined sites are priority sites in the Wetland Network. Other sites are Par: Parinachochas, Lor: Loriscota, Vil: Vilacota in Peru; Sama in Bolivia; HC: Huasco-Coposa, As: Ascotán, SP: Salar de las Parinas, PP: Piedra Parada in Chile.

coordinators designated; and 3) schedule for local training workshops in each country (Marconi, 2009).

In Argentina and Chile we conducted the census during the established timeframe, between 22 January and 2 February, 2010. In Bolivia the census took place from 31 January to 8 February and in Peru from 16–24 February. The shift in starting dates in Bolivia and Peru was due to logistical difficulties. We used the census methods described in Manual de Técnicas de Monitoreo de Condiciones Ecológicas (Marconi, 2010).

Preliminary results of the flamingo census

This is a preliminary presentation of the results that the GCFA is analyzing in depth to be published in a scientific publication. Of the 259 wetlands surveyed, 60% had high Andes flamingos. Total counts were 106,001 Puna Flamingos, 38,675 Andean Flamingos, 280,752 Chilean Flamingos, and 8,623 unidentified flamingos (Table 1).

Unidentified individuals were mostly from priority sites Lagunas de Vilama, Reserva Eduardo Avaroa and Lago Poopó. Comparing censuses of similar coverage (ISC 05 and ISC 10), numbers of Andean and Puna Flamingos are similar. In contrast, there was a marked increase in Chilean Flamingos with the inclusion of lowland wetlands, especially Mar Chiquita-Bañados del Río Dulce and Laguna Llancanelo in ISC 10. Both high Andes flamingo species had similar distribution to prior censuses (Figure 2) (Caziani *et al.*, 2006, 2007).

Table 1. Global results of the International Simultaneous Census (ISC) and Simultaneous Census of Network Sites (SCN) for the three high Andes flamingo species.

	ISC 97	ISC 98	ISC 05	SCN 07	SCN 08	SCN 09	ISC 10
Puna Flamingo	47,619	64,101	105,647	70,333	79,399	80,878	106,001
Andean Flamingo	33,918	27,813	31,962	28,471	28,812	32,708	38,675
Chilean Flamingo	39,087	25,777	40,889	53,199	37,265	51,098	282,752
Phoenicopteridae	0	0	26,547	20,649	115	652	8,623
Total	120,624	117,691	205,045	172,652	145,591	165,336	436,297
Number of Wetlands	93	126	142	94	84	96	259*

ISC: International Simultaneous Census; CSR: Simultaneous Census of Network Sites.
* Includes 26 lowland wetland sites

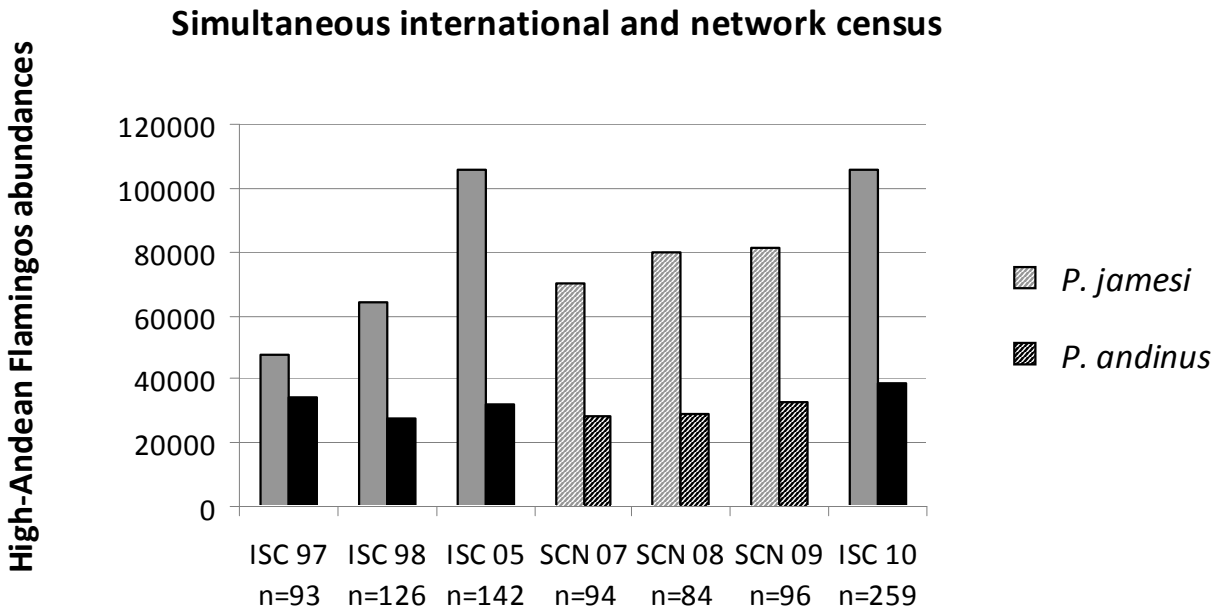

Figure 3. High Andes flamingo abundance in International Simultaneous Censuses (ISC) and Simultaneous Censuses of Network Sites (SCN).

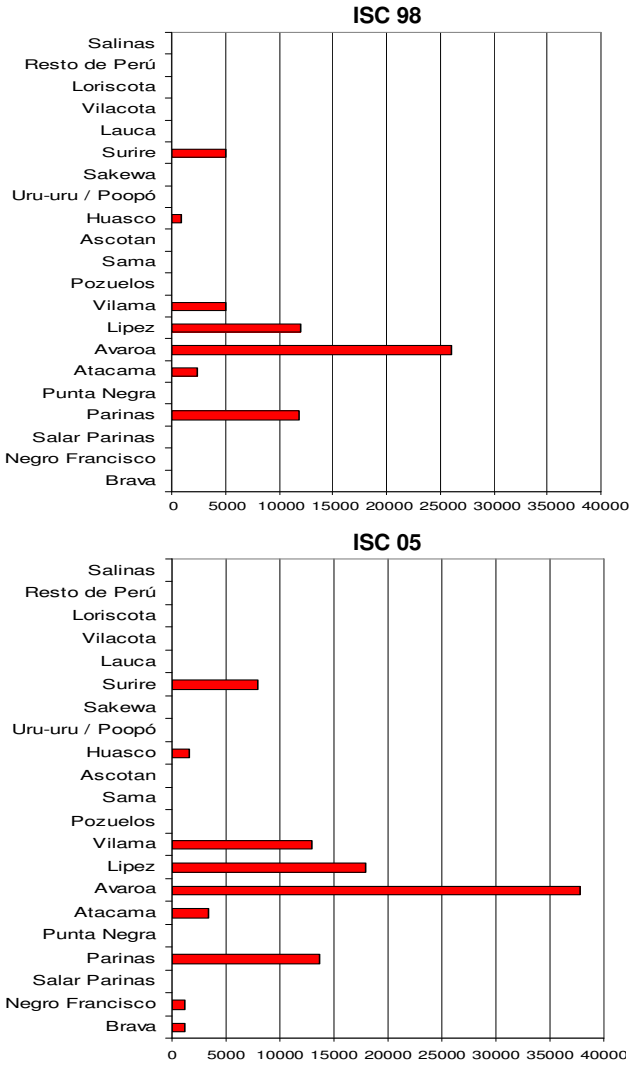

Figure 4. Comparison of Puna Flamingo *Phoenicoparrus jamesi* numbers for ISC 98 and ISC 05.

In summer 2010, Puna Flamingos were found in the high Andes wetlands, with 50% of the population at four wetlands: Laguna Grande and Lagunas de Vilama in Argentina, Laguna Colorada in Bolivia, and Salar de Surire in Chile. The Andean Flamingo had a wider distribution, with 50% of the population in five wetlands: Salar de Surire in Chile, Laguna Colorada in Bolivia and Lagunas de Vilama, Laguna Guayatayoc and Laguna de los Pozuelos in Argentina. The contribution of lowland wetlands to global population numbers is very small, with 408 Andean Flamingos in Mar Chiquita, Argentina. However, 62% of the Chilean Flamingos counted were found in Mar Chiquita.

Comparison between International Simultaneous Censuses and Simultaneous Censuses of Network Sites

With regard to Andean Flamingos, results from the ISC and SCN (Marconi *et al.,* 2007) are similar, indicating a stable population trend in the past 13 years (Figure 3).

For Puna Flamingos, we observed an increase in numbers between ISC 97 and ISC 98 due to the addition of Laguna Grande (Catamarca, Argentina) in 1998. Most of the increase observed in ISC 05 is due to the 68.24% found in the Eduardo Avaroa and Lipez sites (Figure 3). This is consistent with numbers recorded during summer censuses in Bolivia in 1999 and 2000 (Rocha, unpubl. data).

Estimates of abundance for Puna Flamingos during the summer 2007, 2008 and 2009 SCN are similar. We attribute the lowest number recorded in 2007 to the temporal offset between the censuses at Eduardo Avaroa and Lipez (conducted March–April) and the rest of the priority sites (early February) because of seasonal fluctuations when individuals begin to disperse to lower altitude sites as of March. When we compare results from ISC and SCN we conclude that the SCN consistently underestimates Puna Flamingo abundance by about 20%. Looking at Puna Flamingo numbers at each priority site in the Wetland Network (Figure 5), we observe:

- Most of the population is concentrated primarily in Eduardo Avaroa and Lípez (Bolivia), and secondly in Vilama (Argentina) (Figure 2).
- Sustained increase in Las Parinas priority site (Argentina).
- Numbers at Avaroa-Lípez (Bolivia) and Vilama (Argentina) appear to complement and compensate for each other.
- The next two sites in importance, Salar de Atacama and Salar de Surire (Chile) have strong fluctuations in abundance.

We suggest that the Avaroa-Lípez-Vilama complex represents a unit for Puna Flamingos that use the wetlands in this complex in an alternative and complementary way.

From the comparison between ISCs and SCNs we draw the following preliminary conclusions:

1. The priority sites in the Wetland Network are a **representative sample** of concentration sites for Andean and Puna Flamingos such that the results of the SCNs can be considered reasonable extrapolations of total populations, requiring considerably lower cost and effort than that required for total coverage of the summer distribution of both species. However, if we were to detect a decrease in numbers in these priority sites, an immediate assessment of other wetlands would be required to determine if this is the result of change in habitat use by both species or a decrease in global populations.

2. Both **summer ISCs and SCNs should be simultaneous**, with a maximum delay of two weeks from beginning to end. The shift in 3 months during the SCN in Bolivia in 2007 introduced error because offset counts can double count or miss individuals moving among sites. Because of the timing of the offset, this was exacerbated by the seasonal changes (Marconi *et al.,* 2007). At sites above 4,300 m asl, for example, Laguna Colorada (Avaroa site), flamingo numbers are highly seasonal due to dispersal to winter sites at a lower altitude. This would explain the apparent decrease in Puna Flamingo numbers to 9,337 at the end of March 2007 from 18,412 at the end of January 2005.

3. The contribution of lowland wetland sites to numbers of Andean Flamingos (1.05%) and Puna Flamingos (0%) does not justify the effort to census during annual summer SCNs. In contrast, results from winter ISCs (1998 and 2000) and SCNs (Romano *et al.,* 2005; Romano *et al*., 2006; Romano *et al.,* 2008; Romano *et al.,* 2009) show that winter monitoring yields essential information on distribution and habitat use of both flamingo species, but especially for Andean Flamingos.

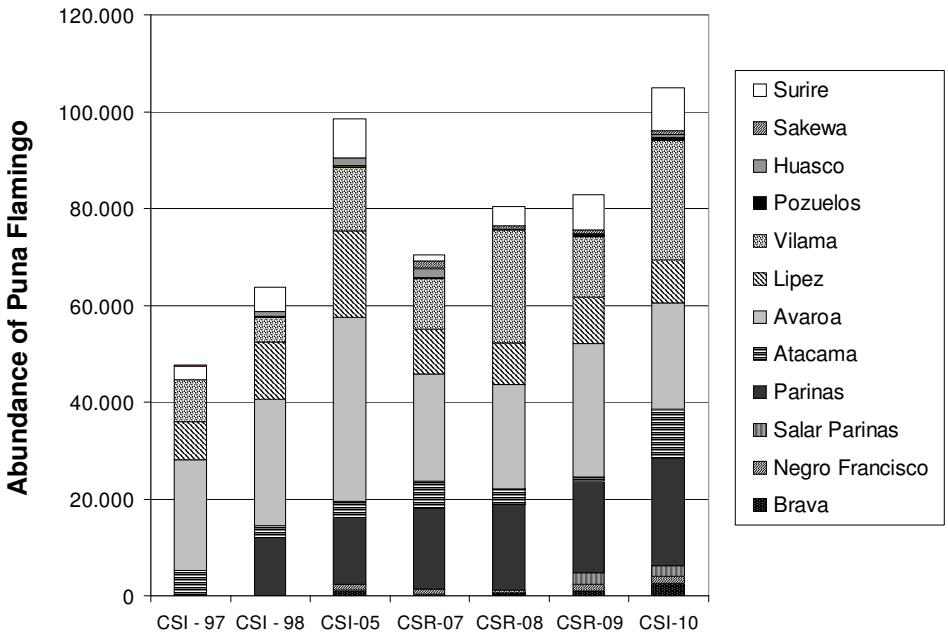

Figure 5. Puna Flamingo *Phoenicoparrus jamesi* abundance in the Wetland Network recorded during ISCs and SCNs.

We recommend continuing simultaneous annual summer censuses in high Andes priority sites of the Wetland Network (SCNs) and simultaneous winter censuses in lowland priority sites, Pozuelos (Moschione *et al.,* 2008), Poopó (Rocha *et al.,* 2006) and Saquehua, to monitor high Andes flamingo populations and their habitats.

Finally, the ISC 10 census included lowland wetland sites that have large summer concentrations of Chilean Flamingo – Mar Chiquita, Bañados del río Dulce, Salinas Grandes, Salinas de Ambargasta and Laguna Llancanelo – but it did not cover the entire distribution range of this species. However, the number recorded (282,752) is above the current estimate of 200,000 for the global population. A more accurate estimate of the Chilean Flamingo global population should be 300,000.–

Acknowledgements

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