NEW INFORMATION OF STOPOVER SITES FOR *CHLOEPHAGA* GEESE IN CENTRAL PATAGONIA: POTENTIAL IMPLICATIONS FOR RUDDY-HEADED GOOSE (*CHLOEPHAGA RUBIDICEPS*) CONSERVATION

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Abstract.- Three migratory species of sheldgeese (*Chloephaga* spp.) make seasonal movements across a large portion of the Argentine territory. All three of these species have been affected by anthropogenic actions which have caused dramatic population drops, especially for the Ruddy-headed Goose (*Chloephaga rubidiceps*). Although telemetry techniques have rapidly advanced, knowledge of the migratory routes of many Neotropical birds is still incipient. The study of migration routes should be a top priority, especially when conservation and management actions are necessary along the main migratory routes. The goal of this work is to present new evidence of important stopover sites and concentration areas of migratory sheldgeese in eastern Patagonia. We conducted fieldwork during the fall, winter and spring of 2017, all of 2018 and the summer of 2019 in Chubut province, Argentina. We identified one stopover area for sheldgeese within a recently created protected area, the Parque Interjurisdiccional Marino Costero Patagonia Austral (PIMCPA), that could be a key site for the protection of the three species, in particular for the Ruddy-headed Goose. Results will provide input for decision-making processes during the design of future infrastructure projects already planned in eastern Patagonia along the migratory route of several species.

Key words: *conservation, Parque Interjurisdiccional Marino Costero Patagonia Austral, migration, sheldgeese, stopover.*

Resumen.- NUEVA INFORMACIÓN SOBRE SITIOS DE ESCALA PARA CAUQUENES *CHLOEPHAGA* EN PATAGONIA CENTRAL: IMPLICANCIAS POTENCIALES PARA LA CONSERVACIÓN DEL CAUQUÉN COLORADO (*CHLOEPHAGA RUBIDICEPS*). Tres especies de cauquenes (*Chloephaga* spp.) migratorios realizan movimientos estacionales a lo largo de gran parte del territorio argentino. Todas han sido afectadas por acciones antrópicas, lo cual ha causado declives dramáticos en sus poblaciones, especialmente en el Cauquén Colorado (*Chloephaga rubidiceps*). Si bien en la actualidad las técnicas de telemetría han avanzado, el conocimiento de las rutas migratorias de muchas aves del Neotrópico aún es incipiente. El estudio de las rutas migratorias debe ser prioritario, principalmente cuando acciones de conservación y manejo son necesarias a lo largo de las mismas. El objetivo del presente trabajo es dar a conocer nuevas evidencias de sitios de escala y áreas de concentración de cauquenes migratorios en el Este de la Patagonia. Trabajamos durante el otoño, invierno y primavera de 2017, todo el año 2018 y verano de 2019 en la provincia de Chubut, Argentina. Identificamos un área de escala para las tres especies, en el Parque Interjurisdiccional Marino Costero Patagonia Austral (PIMCPA), como sitio de gran importancia para la conservación de las tres especies durante la migración, particularmente para el cauquén colorado. Los resultados obtenidos podrían servir en la toma de decisiones durante futuros proyectos de infraestructura planeados en el Este de Patagonia a lo largo de las rutas migratorias de varias especies.

Palabras clave: *conservación, Parque Interjurisdiccional Marino Costero Patagonia Austral, migración, cauquenes, sitios de escala.*

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Understanding the basic aspects of the natural history of a native species is crucial for its conservation (Sutherland 2000). In terms of understanding the natural history of migratory birds, it is necessary to incorporate studies about migration, including routes, timing, stopovers sites and some other special aspects such as genetics or physiology (López –López et al. 2009). Migration studies are vital for conservation since most of the areas used during that period of the life cycle of migratory species, which are usually different from the wintering or breeding areas, require appropriate management strategies (Dolman and Sutherland 1994, Newton 1998, Webster et al. 2002).

The genus *Chloephaga* is composed of four species that inhabit the southernmost part of South America, mostly in Patagonia, commonly known as sheldgeese (Carboneras 2019). The Upland Goose (*Chloephaga picta*) has the most extensive distribution and it breeds in steppe and woods where it builds its nests on the ground near water, along the river's valley or around the lakes (Summers 1983, Cossa et al. 2018). The Ruddy-headed Goose (*C. rubidiceps*) breeds in the Magellanic steppe, in the southern part of Santa Cruz and Tierra del Fuego provinces (Matus et al. 2000), while the Ashy-headed Goose (*Chloephaga poliocephala*) only inhabits mainland Patagonia (including the Tierra del Fuego archipelago), where it breeds in wooded and ecotonal areas (Matus et al. 2000).

Patagonian populations of all three species migrate from the breeding grounds the end of April (Martin et al. 1986, Blanco et al. 2003, Rumboll et al. 2005, Pedrana et al. 2015), towards the wintering sites located in southern Buenos Aires Province, and, to a lesser extent, to northeastern Río Negro and eastern La Pampa provinces (Rumboll 1975, 1979, Canevari 1996, Blanco et al., 2003, 2008, Blanco and de la Balze 2006, Petracci et al., 2008, 2009). For sheldgeese, there are two potential migration routes based on data from banded individuals (Lucero 1992, Rumbol et al. 2005) and information provided by farmers and naturalists throughout southern Argentina (Plotnick 1961, Summers and McAdam 1993). One route runs across eastern Patagonia along the Atlantic coast and the second route is along the Andes. From the information (records) provided by the citizen science database eBird, we were able to infer that some Ashy-headed geese migrate along the Andes and overwinter in the northwestern part of Patagonia (eBird 2019). None of the three species are classified under any of the global threat categories (BirdLife International 2020). However, in Argentina both the Upland Goose and the Ashy-headed Goose are categorized as endangered and the Ruddy-headed Goose as critically endangered (MAyDS and AA 2017). In Chile, the Ruddy-headed Goose is also categorized as endangered (MMA 2019). A great part of the Upland and the Ruddy-headed Goose populations inhabit Argentina and Chile, but the global conservation status is probably underestimated due to the Malvinas Islands populations, especially for the Ruddy-headed Goose. In Malvinas Islands , there are between 28 000 and 54 000 Ruddy-headed geese, while in Argentina and Chile approximately 1000 are estimated. For the Upland Goose, there are no accurate numbers for the continental population (Wetlands International 2020). Strong genetic differences have been detected between the island and the continental populations of both the Upland and the Ruddy-headed Goose (Bulgarella et al. 2014); thus, their conservation status will probably soon be reassessed.

The most important factors described as the causes of sheldgeese populations' decline are massive destructions of eggs by governmental campaigns carried out between 1940-1970 (Pergolani de Costa 1955, Martin 1984, Canevari 1996), use of pesticides in the wintering areas (Canevari 1996, de la Balze and Blanco 2002, Madsen et al. 2003, Blanco and de la Balze 2006, Blanco et al. 2009, Mac Lean 2012), habitat modification in their breeding grounds (Fjeldså 1988), invasive species such as the American Mink (*Neovison vison*) – across all Patagonia– and the Grey Fox (*Pseudalopex griseus*) – in Tierra del Fuego Island– (Rumboll 1975, Canevari 1996, Madsen et al. 2003, Blanco et al. 2003, 2008, Blanco and de la Balze 2006, Cossa et al. 2017), and sport hunting (up to the present day, especially on their wintering grounds).

Sheldgeese are relatively simple to monitor due to their body size, tendency to form large groups, and to inhabit relatively predictable areas, both in the wintering (agricultural fields) and breeding areas (wetlands), as well as during migration (Petracci et al. 2008). Populations censuses in Argentina were carried out in the wintering area between 1975 (Rumboll 1979) and 1984 (Martin 1984), and then between 1986 (Martin et al. 1986) and 2007 (Petracci et al. 2008). Since 2007, sheldgeese winter monitoring has been carried out in Buenos Aires, Río Negro, La Pampa and Chubut provinces, and from 2012 monitoring started in the breeding areas of Tierra del Fuego and Santa Cruz, all coordinated by the Wildlife Office of the Ministry of Environment and Sustainable Development of Argentina, and Wetlands International (Blanco et al. 2001, Petracci et al. 2008).

The objective of our study is to present new evidence of important stopover sites and concentrations of migratory *Chloephaga* in Chubut province. We will also discuss the importance of these new sites for sheldgeese conservation.

METHODS

Fieldwork was carried out in southeastern Chubut province (from 44°29'27" S to 45°7'33" S and from 66°19'19" W to 66°32'31" W) in Patagonia, Argentina

(Fig. 1). The climate of east-central Patagonia is temperate-cold, arid to semi-arid, with an average winter temperature of 7°C and 18°C in summer. Temperatures below 0°C are frequent during the colder months, and in summer peaks above 30°C are also usual. Rainfall reaches 250 mm per year, concentrated mostly in fall and winter (Cabrera 1971). The habitat in the region is Patagonian Steppe within the Patagonian Province - San Jorge Gulf District (Cabrera 1971). This steppe is dominated mostly by grasslands and mid-size open shrublands that connect with the coastal marine landscape (Burkart et al. 1999).

Chubut province holds some of the greatest levels of marine biodiversity of the Argentine Atlantic coast: a wide variety of species inhabit different ecosystems, including marine, intertidal, marshes, wetlands, and steppe (Bahía Bustamante and Punta Tombo). The Parque Interjurisdiccional Marino Costero Patagonia Austral (PIMCPA) is located in southeastern Chubut and is a vast and important corridor for the conservation of Patagonian marine coastal biological diversity. It has a surface of 104 812 ha, of which 31 052 ha are terrestrial and 77 760 ha are marine. In particular, the coastal zone presents numerous bays and rocky coves, either protected or exposed to waves, including environments of muddy substrates and fine sand. Rocky reefs and numerous islands and islets give the area particular features that differentiate it from the rest of the Patagonian coastline (Yorio 1998).

Censuses were conducted once per season from fall 2017 to summer 2019 (2017: 4-7 May, 16-21 August, 2-7 October, 2018: 1-7 February, 19-26 May, 19, 21-27 August, 21-28 October, 2019: 4-10 February). We carried out transect censuses following roads in Patagonian continental habitat and close to the Atlantic Coast, which ranged from Camarones (44°47'38" S, 65°43'22" W) to the intersection with National Route Nº3 (44°35'38" S, 66°30'28" W) and from Cabo Raso (44°29'27" S, 66°19'19" W) to Bahía Bustamante (45°7'33" S, 66°32'31" W), Florentino Ameghino and Escalante departments, respectively (Fig. 1). This area includes the PIMCPA.

Censuses were carried out using vehicles moving at low speed (<60 km/h), with no fixed-width transects (following Cossa et al. 2017). Transects included main roads (Provincial Routes N° 30 and N° 1) and secondary roads, with a total of *c.* 260 km traveled during each survey. We used 10x42 binoculars (Leica and Nikon) and 20-60x spotting scopes (Swarovski and

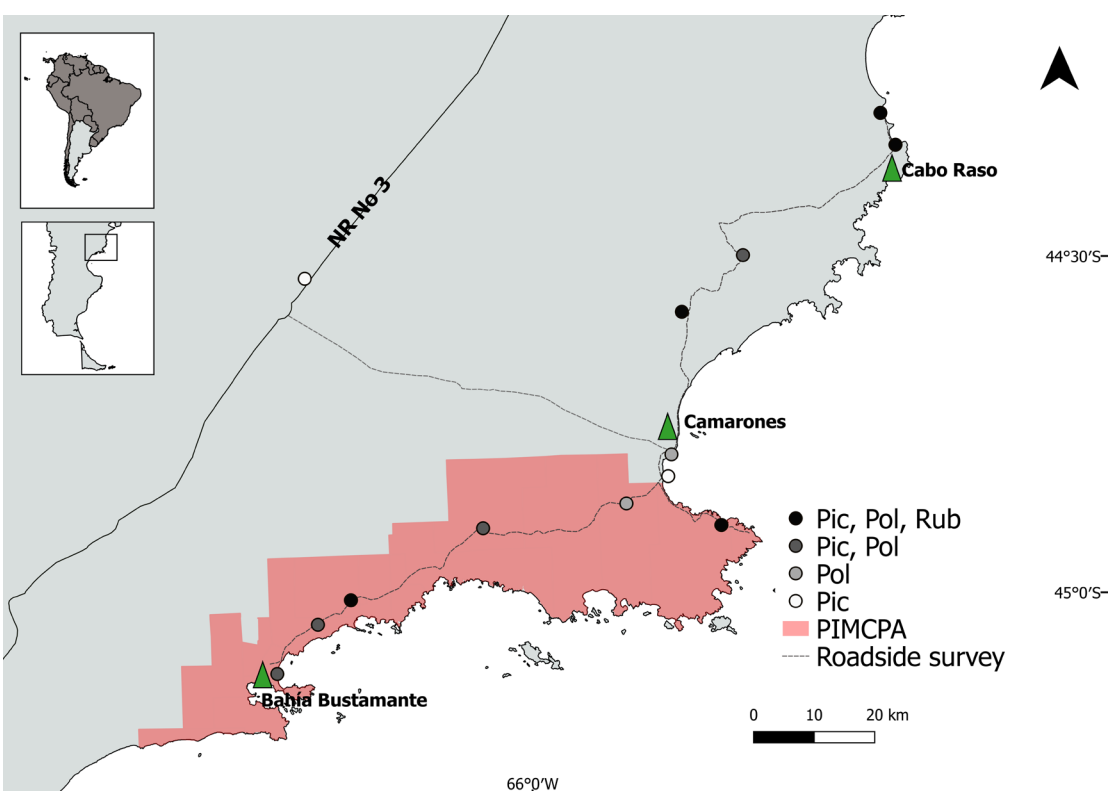

Figure 1. Distribution and composition of migratory *Chloephaga* spp. flocks registered during the May 2017 census in Chubut province, Argentina. Pic: *Chloephaga picta*, Pol: *Chloephaga poliocephala*, Rub: *Chloephaga rubidiceps* and PIMCPA: Parque Interjurisdiccional Marino Costero Patagonia Austral.

Kowa) to register flying or resting individuals/groups of the three sheldgeese species. We identified each species by their general shape, size and coloration. We were not able to identify all flocks to species level, since many were detected at far distances (depending on weather conditions and distance to the flock). We conducted a descriptive analysis of group composition using the information of those groups observed during May 2017, since it was the survey in which the highest concentrations of individuals were detected.

RESULTS

We did not detect sheldgeese during all censuses. During 2017 and 2018, we detected sheldgeese in May, August and October. In February of 2018 and 2019, no individuals of any sheldgeese species were detected (Table 1).

The analysis of group conformation made with the observations in May 2017 showed relatively constant proportion patterns, with groups composed of the three species (N=5), groups formed only by Upland and Ashy-headed geese (N=5), or monospecific groups of either Ashy-headed (N=2) or Upland Geese (N=1). No monospecific Ruddy-headed Goose groups were detected. The proportion of each species in mixed flocks (three species) were 85% individuals of Ashy-headed Goose, 13% Upland Goose and 2% Ruddy-headed Goose. In the case of flocks formed by Upland Goose and Ashy-headed Goose, the proportion was 18% and 82%, respectively.

DISCUSSION

Our results suggest that the PIMCPA area is an important stopover site for migratory *Chloephaga* spp. The variation in the number of individuals between different campaigns supports the idea of a migratory population in the area, consistent with the information presented by Pedrana et al. (2018), and by more recent information provided by Pedrana et al. (2020). The direction of the flying groups during May 2017 was consistent with groups following a south-north migration route along the coastline of the Atlantic Ocean. The low numbers detected during spring and summer in the area may indicate that the PIMCPA area may not be important for reproduction.

The presence of Upland Goose and Ashy-headed Goose was recorded in 12 and 13 National Parks of Argentina, respectively (SIB 2019). Meanwhile Ruddy-headed Goose has only been recorded in four national parks, but without further evidence (Chebez et al. 1998, Romiti and Martínez 1999, Imberti 2007, Müller 2002, Tittarelli 2005, Carrizo 1989). Therefore, PIMCPA is the first confirmed protected area for all three species of migratory sheldgeese. Pictures of Ruddy-headed Goose obtained in PIMCPA are the first confirmed and validated evidence of that species within a protected national park of Argentina.

According to estimates obtained at the beginning of the 20th Century, Ruddy-headed Goose was as abundant as Upland Goose, but the continental population experienced a drop of close to 90% (Cossa et al. 2017). Therefore, our results indicate that PIMCPA and the surrounding areas are probably important for Ruddy-headed Goose conservation.

Although recent satellite tracking information of sheldgeese has been published (Pedrana et al. 2018, 2020), there is an urgent need of information about the migratory pathways of other continental species and their stopover sites, in order to mitigate and/or minimize the impact of infrastructure development on migratory sheldgeese throughout central and eastern Patagonia, especially in Chubut and Santa Cruz provinces. For example, wind farms are being built all over Patagonia, having a potential negative impact on sheldgeese, as seen for other goose populations (Rees 2012). Nuclear plants and hydroelectric dams are also being developed in Patagonia or there are plans to build them, which may also have a negative impact on migratory routes, including known impacts of transmission energy lines; i.e., causing death by electrocution or collision (APLIC 2012). The hydroelectric dams to be built on the Santa Cruz River will impact c. 50% its basin, having a negative impact down river, not only affecting important stopover sites of sheldgeese, but also destroying crucial breeding habitats for other birds (Cossa et al. 2018, Fasola and Roesler 2018). It is crucial to continue studying sheldgeese in their breeding and wintering areas, but also at stopover sites, to maximize the efficiency of conservation strategies. Surveys should focus on decreasing trends in the population size of the Ruddy-headed Goose at sites regularly used by the species and by searching for groups in new areas based on previously identified environmental characteristics. Therefore, to coordinate efforts among the different actors (mainly provincial and national agencies and conservation NGOs) it will be necessary to continue ongoing monitoring, conducting censuses, and also

Table 1. Numbers of individuals of Upland Goose (*Chloephaga picta*), Ashy-headed Goose (*C. poliocephala*), and Ruddy-headed Goose (*C. rubidiceps*) registered in 2017, 2018 and 2019 in Chubut province, Argentina.

	Upland Goose	Ashy-headed Goose	Ruddy-headed Goose	Unidentified sheldgeese
4-7 May 2017	335	2066	22	7000
16-21 August 2017	261	42	-	-
2-7 October 2017	15	-	-	-
1-7 February 2018	-	-	-	-
19-26 May 2018	51	2	-	-
21-27 August 2018	712	56	-	207
21-28 October 2018	8	-	-	-
4-10 February 2019	-	-	-	-

exploring new areas. Monitoring during the fall and spring migrations (April-May and August-September, respectively) will also provide knowledge of trends at stopover sites, as well as about migratory movements of the three species. Information provided by satellite transmitters belongs to single or small groups of individuals. On the other hand, ground monitoring will provide large scale population information and data about impacts from population abundances compared from year to year. Therefore, we strictly recommend a continuous survey of sheldgeese populations in different important areas of Patagonia, in order to add ground-based information to compare with tracking data. Identifying important areas used by large flocks, including their micro habitat use, is crucial since any threat operating at specific sites could have a great impact on a large part of their population.

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LITERATURE CITED

APLIC (2012) *Reducing Avian Collisions with Power Lines: The State of the Art in 2012*. The Avian Power Line Interaction Committee (APLIC), Washington DC

BirdLife International (2020) *IUCN Red List for birds* (URL: http://www.birdlife.org)

Blanco DE and de la Balze VM (2006) Harvest of migratory geese (*Chloephaga* spp.) in Argentina: an overview of the present situation. Pp. 870–873 in: Boere GC, Galbraith CA and Stroud DA (eds) *Waterbirds around the world: a global overview of the conservation, management and research of the world's waterbird flyways*. The Stationery Office, Edinburg

Blanco DE, de la Balze VM and López–Lanús B (2008) *Situación actual y propuesta de acciones para la conservación del Cauquén Colorado y otras especies de cauquenes o "avutardas" en el sur de la provincia de Buenos Aires*. Wetlands International/Fundación Humedales, Buenos Aires

Blanco DE, Matus R, Blank O, Benegas L, Goldfeder S, Moschione F and Zalba S (2001) *Manual para la conservación del cauquén (Cauquén) colorado en Argentina y Chile*. Wetlands International, Buenos Aires

Blanco DE, Matus R, de La Balze VM, Blank O, Mac–Lean D, Zalba S, Imberti S, Benegas LG and Petracci PF (2009) *El Cauquén Colorado (Chloephaga rubidiceps) en peligro de extinción: Estatus poblacional y acciones de conservación en Argentina y Chile*. Wetlands International, Buenos Aires

Blanco DE, Zalba SM, Belenguer CJ, Pugnali G and Rodríguez Goñi H (2003) Status and conservation of the ruddy–headed goose *Chloephaga rubidiceps* Sclater (Aves, Anatidae) in its wintering ground (Province

of Buenos Aires, Argentina). *Revista Chilena de Historia Natural* 76:47–55

BULGARELLA M, KOPUCHIAN C, DI GIACOMO AS, MATUS R, BLANK O, WILSON RE AND MCCRACKEN KG (2014) Molecular phylogeny of the South American sheldgeese with implications for conservation of Falkland Islands (Malvinas) and continental populations of the Ruddy–headed Goose *Chloephaga rubidiceps* and Upland Goose *C. picta*. *Bird* Conservation International 24:59–71

BURKART R, BÁRBARO NO, SANCHEZ RO AND GÓMEZ DA (1999) *Eco–regiones de la Argentina*. Administración de Parques Nacionales, Secretaría de Recursos Naturales y Desarrollo Sostenible, Presidencia de la Nación, Buenos Aires

CABRERA AI (1971) Fitogeografía de la República Argentina. *Boletín de la Sociedad* Argentina de Botánica 14:1–42

CANEVARI P (1996) The Austral Geese (*Chloephaga* spp.) of southern Argentina and Chile: a review of its current status. *Gibier Faune Sauvage, Game Wildlife* 13:335–366

CARBONERAS C (2019) Ducks, Geese, Swans (*Anatidae*) in: DEL HOYO J, ELLIOTT A, SARGATAL J, CHRISTIE DA AND DE JUANA E (eds) *Handbook of the Birds of the World Alive*. Lynx Edicions, Barcelona (URL: https://www.hbw.com/node/52210)

CARRIZO A (1989) *Aves acuáticas Lago Hess–Roca–Fonck PN Nahuel Huapi*. Nota No. 359. Administración de Parques Nacionales, San Carlos de Bariloche

CHEBEZ JC, REY NR, BARBASKAS M AND DI GIACOMO AG (1998) *Las aves de los Parques Nacionales de la Argentina*. L.O.L.A., Buenos Aries

COSSA NA, FASOLA L, ROESLER I AND REBOREDA JC (2017) Ruddy–headed Goose *Chloephaga rubidiceps*: former plague and present protected species on the edge of extinction. *Bird Conservation International* 27:269–281

COSSA NA, FASOLA L, ROESLER I AND REBOREDA JC (2018) Incubating Upland Goose (*Chloephaga picta*) differential response to livestock, human and predator nest disturbance. *Wilson Journal of Ornithology* 130:739–745

DE LA BALZE VM AND BLANCO DE (2002) El cauquén Colorado (*Chloephaga rubidiceps*): una especie amenazada por la caza de avutardas. Pp. 119–122 in: BLANCO DE, BELTRÁN J AND DE LA BALZE V (eds) *Primer taller sobre caza de aves acuáticas; hacia una estrategia para el uso sustentable de los recursos de los humedales*. Wetlands International, Buenos Aires.

DOLMAN PM AND SUTHERLAND WJ (1994) The response of bird populations to habitat loss. *Ibis* 137:38–48

EBIRD (2019) eBird: An online database of bird distribution and abundance (web application). eBird, Cornell Lab of Ornithology, Ithaca (URL: http://www.ebird.org)

FASOLA L AND ROESLER I (2018) A familiar face with a novel behavior raises challenges for conservation: American mink in arid Patagonia and a critically endangered bird. *Biological* Conservation 218:217–222

FJELDSÅ J (1988) Status of birds of steppe habitats of the Andean zone and Patagonia. *ICBP Technical Publication* 7:81–95

IMBERTI S (2007) Monumento Natural Bosques Petrificados y Estancia El Cuadro. Pp 417–418 in: DI GIACOMO AS, DE FRANCESCO MV AND COCONIER EG (eds) Áreas importantes para la conservación de las aves en Argentina. Sitios prioritarios para la conservación de la biodiversidad. Temas de Naturaleza y Conservación. Volumen 5. Aves Argentinas/Asociación Ornitológica del Plata, Buenos Aires

LUCERO MM (1992) Nuevos aportes al conocimiento migratorio de *Chloephaga picta* (Gmelin) en la República Argentina. *Acta Zoológica Lilloana* 42:165–170

LÓPEZ–LÓPEZ P, LIMIÑANA R AND URIOS V (2009) Autumn migration of Eleonora's Falcon *Falco eleonorae* tracked by satellite telemetry. Zoological Studies 48:485–491

MAC LEAN D (2012) La relación entre los productores rurales y los cauquenes (*Chloephaga spp.*), en inmediaciones del arroyo Cristiano Muerto (partidos de San Cayetano y Tres Arroyos, Provincia de Buenos Aires, Argentina). *BioScriba* 5:12–22

MADSEN J, MATUS R, BLANK O, BENEGAS L, MATEAZZI G AND BLANCO DE (2003) Populations status of the Ruddy–headed Goose (*Chloephaga rubidiceps*) in Tierra del Fuego and mainland Patagonia (Chile and Argentina). *Ornitología Neotropical* 14:15–28

MARTIN SI (1984) La avutarda magallánica (*Chloephaga picta*) en la Patagonia: su ecología, alimentación, densidad y control. *IDIA* 2:429–432

MARTIN SI, TRACANNA N AND SUMMERS RW (1986) Distribution and habitat use of sheldgeese populations wintering in Buenos Aires Province, Argentina. *Wildfowl* 37:55–62

MATUS R, BLANK O, BLANCO D, MADSEN J, BENEGAS L AND MATEAZZI G (2000) El Canquén Colorado (*Chloephaga rubidiceps*): antecedentes sobre sitios de reproducción y concentración en la XII Región de Magallanes, Chile. *Boletín Chileno de Ornitología* 7:13–18

MAYDS AND AA (2017) *Categorización de las aves de la Argentina*. Informe del Ministerio de Ambiente y Desarrollo Sustentable de la Nación y de Aves Argentinas, edición electrónica. C. A. Buenos Aires, Argentina

(URL: https://avesargentinas.org.ar/sites/default/files/Categorizacion–de–aves–de–la–Argentina.pdf)

MMA (2019) *Inventario de las Especies Silvestres*. Ministerio del Medio Ambiente, Gobierno de Chile (URL: http://especies.mma.gob.cl)

Müller G (2002) *Listado de fauna del Parque Nacional Lihue Calel*. Nota N° 50. Administración de Parques Nacionales, San Carlos de Bariloche

Newton I (1998) *Population limitation in birds*. Academic Press, London

Pedrana J, Pütz K, Bernad L, Muñoz S, Gorosábel A, Castresa G, Leiss A and Seco Pon JP (2020) Spatial and temporal variation in the migration of Ruddy–headed Goose in southern America using satellite tagging. *Bird Conservation International* (in press).

Pedrana J, Pütz K, Bernad L, Seco Pon JP, Gorosabel A, Muñoz SD, Isacch JP, Matus R, Blank O, Lüthi B, Lunardelli M and Rojas P (2018) Migration routes and stopover sites of Upland Geese *Chloephaga picta* in South America. *Avian Biology Research* 11:89–99

Pedrana J, Seco Pon JP, Isacch JP, Leiss A, Rojas PO, Castresana G, Calvo J, Bernad L, Muñoz SD, Maceira NO and Pütz K (2015) First insights into the migration pattern of an upland goose (*Chloephaga picta*) based on satellite tracking. *Ornitologia* Neotropical 26:245–253

Pergolani de Costa M (1955) Las avutardas: especies que dañan a los cereales y las pasturas. *IDIA* 88:1–9

Petracci PF, Ibáñez H, Scorolli A, Cozzani N, Blanco D, de la Balze V, Forcelli D, Goldfeder S, Mac Lean D, Carrizo M, Zamorano M, Cereghetti J, Sarriá R and Veiga J (2008) *Monitoreo poblacional de sheldgeese migratorios (Chloephaga spp.) en las provincias de Buenos Aires y Río Negro: Una actualización sobre su estado crítico de conservación*. Secretaría de Ambiente y Desarrollo Sustentable de la Nación, Buenos Aires

Petracci PF, Faillá M, Blanco D, Forcelli D, Cozzani N, de la Balze V, Mac Lean D, López–Lanús B, Carrizo M, Sarria R, Bogdaschewsky R, Cereghetti J, León M, Díaz L, Areco A, Giovine P, Bustamante C, Veiga J, Sotelo M, Urioste M and Delarada S (2009) *Monitoreo poblacional de cauquenes migratorios (Chloephaga spp.) en las provincias de Buenos Aires y Río Negro, julio de 2008*. Plan Nacional de Conservación y Manejo de Sheldgeese. Secretaría de Ambiente y Desarrollo Sustentable de la Nación, Buenos Aires

Plotnick R (1961) La avutarda de pecho rallado. IDIA 157:9–22

Rees EC (2012) Impacts of wind farms on swans and geese: a review. *Wildfowl* 62:37–72

Romitti DG and Martínez MG (1999) *Aves del Parque Nacional Laguna Blanca Información actualizada 1993–98*. Boletín Técnico editado por el P.N. Laguna Blanca. Administración de Parques Nacionales, Zapala

Rumboll MAE (1975) El Cauquén de Cabeza Colorada (*Chloephaga rubidiceps*): Una nota de alarma. *Hornero* 11:315–316

Rumboll MAE (1979) El estado actual de *Chloephaga rubidiceps*. *Acta Zoológica Lilloana* 34: 153–154

Rumboll MAE, Capllonch P, Lobo R and Punta G (2005) Sobre el anillado de aves en la Argentina: Recuperaciones y recapturas. *Nuestras Aves* 50:21–24

SIB (2019) Sistema de Información de Biodiversidad. Administración de Parques Nacionales de Argentina, Buenos Aires (URL: https://sib.gob.ar)

Summers RW (1983) The life cycle of the Upland Goose *Chloëphaga picta* in the Falkland Islands. *Ibis* 125:524–544

Summers RW and McAdam JH (1993) *The Upland Goose: a study of the interaction between geese, sheep and men in the Falkland Islands*. Bluntisham Books, Huntingdon

Sutherland WJ (2000) *The conservation handbook: research, management, and policy*, Blackwell Science, Oxford

Tittarelli F (2005) Parque Nacional Lihué Calel. Pp. 247–248 in: Di Giacomo AS (ed) *Áreas importantes para la conservación de las aves en Argentina. Sitios prioritarios para la conservación de la biodiversidad: Temas de Naturaleza y Conservación.* Aves Argentinas/ Asociación Ornitológica del Plata, Buenos Aires

Webster MS, Marra PP, Haig SM, Bensch S and Holmes RT (2002) Links between worlds: unraveling migratory connectivity. *Trends in Ecology & Evolution* 17:76–83

Wetlands International (2020) W*aterbird Population Estimates* (URL: http://wpe.wetlands.org/)

Yorio P (1998) Zona costera patagónica. Pp. 137–167 in: Canevari P, Blanco DE, Bucher EH, Castro G and Davidson I (eds) *Los Humedales de la Argentina. Clasificación, Situación Actual, Conservación y Legislación*. Publication N°46. Wetlands International, Buenos Aires