

RESIGHTINGS OF TWO-BANDED PLOVERS (*CHARADRIUS FALKLANDICUS*) DURING THE BREEDING SEASON IN COASTAL CHUBUT, PATAGONIA, ARGENTINAGlenda Denise Hevia^{1,2} · Fredrick Dallas Jordan³ · Noé Terorde⁴ · Marcelo Bertellotti¹ · Verónica L. D' Amico¹

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Abstract · We report resightings of individually-marked Two-banded Plovers (*Charadrius falklandicus*) breeding in northern Patagonia across two consecutive seasons in two beaches separated by approximately 65 km in a straight line: Playas Blancas (Península Valdés) and Playa Paraná (Puerto Madryn), Chubut province, Argentina. We captured and banded 24 adults at the nest while incubating during 2016. Nineteen banded individuals (ca. 80%) were resighted in 2017, 17 on the same site where they were banded, while 2 moved between survey sites. Only 32% were found breeding again while the remaining 68% were resighted resting or foraging, solitarily or in mixed flocks with other shorebird species. Among the resighted breeders, two adults were found paired with a different banded partner as in the previous year. The remaining breeders were paired with unbanded partners, and hence mate fidelity could not be assessed. Our findings add information to the scarce data on the breeding biology of this species suggesting that Two-banded Plovers exhibit site fidelity.

Resumen · Avistamientos de Chorlos Doble Collar (*Charadrius falklandicus*) durante el período reproductivo en la costa de Chubut, Patagonia, Argentina

Presentamos avistamientos de Chorlos Doble Collar (*Charadrius falklandicus*) anillados en dos playas de la provincia de Chubut, Argentina: Playas Blancas (Península Valdés) y Playa Paraná (Puerto Madryn) separadas entre sí aproximadamente 65 km en línea recta. En la temporada 2016, se capturaron y anillaron 24 individuos adultos durante la incubación. La mayoría de ellos (19, ca. 80%) fueron avistados en la temporada 2017, 17 en el mismo sitio donde fueron anillados y 2 en el otro sitio de estudio. El 32% se observó anidando mientras que, el 68% restante, se observó en el área descansando o alimentándose en forma solitaria o en bandadas mixtas con otras especies de aves playeras. Entre los individuos reproductores en 2017, dos anidaron con parejas también anilladas aunque diferentes al año anterior. Los reproductores restantes se observaron con parejas no marcadas, por lo que no se pudo evaluar si estaban apareados con el mismo individuo que en la temporada anterior. Estos resultados aportan nuevos datos sobre la biología reproductiva de esta especie que se suman a los estudios previos en la zona, sugiriendo que los Chorlos Doble Collar muestran fidelidad al sitio reproductivo.

Key words: Banding · Breeding season · Chubut · Resightings · Site fidelity · Shorebirds

INTRODUCTION

The Two-banded Plover (*Charadrius falklandicus*) is a little-known shorebird widely distributed in the southern Neotropical region with a breeding range extending from approximately 37° S to 55° S, including Argentina, Chile, Uruguay, and Brazil (Wiersma et al. 2018). The Atlantic population primarily breeds along the Patagonian coasts south to Tierra del Fuego, Argentina (Blanco & Canevari 1995), but there is also a breeding population likely resident in the Malvinas (Falkland) Islands (Woods 1988). In the Patagonian population, many birds seem to migrate north reaching southern Brazil, while others remain in Patagonia during the non-breeding period (Hayman et al. 1986).

The information on the breeding biology of the Two-banded Plover is still scarce however, much of the knowledge comes from Chubut province, Argentina, where short-term studies have been conducted shedding light on some aspects of breeding ecology (e.g., spatio-temporal distribution, reproductive success, parental care, and breeding dispersal between years; García-Peña et al. 2008; 2009), reproductive habitat selection (Villabriga 2011) and conservation management actions in breeding grounds (Hevia 2013). Although the socially mating system of the Two-banded Plover is in general unknown (Maher et al. 2017), some reports suggested that the populations of Malvinas (Falkland) Islands (St. Clair et al. 2010) and Chubut province

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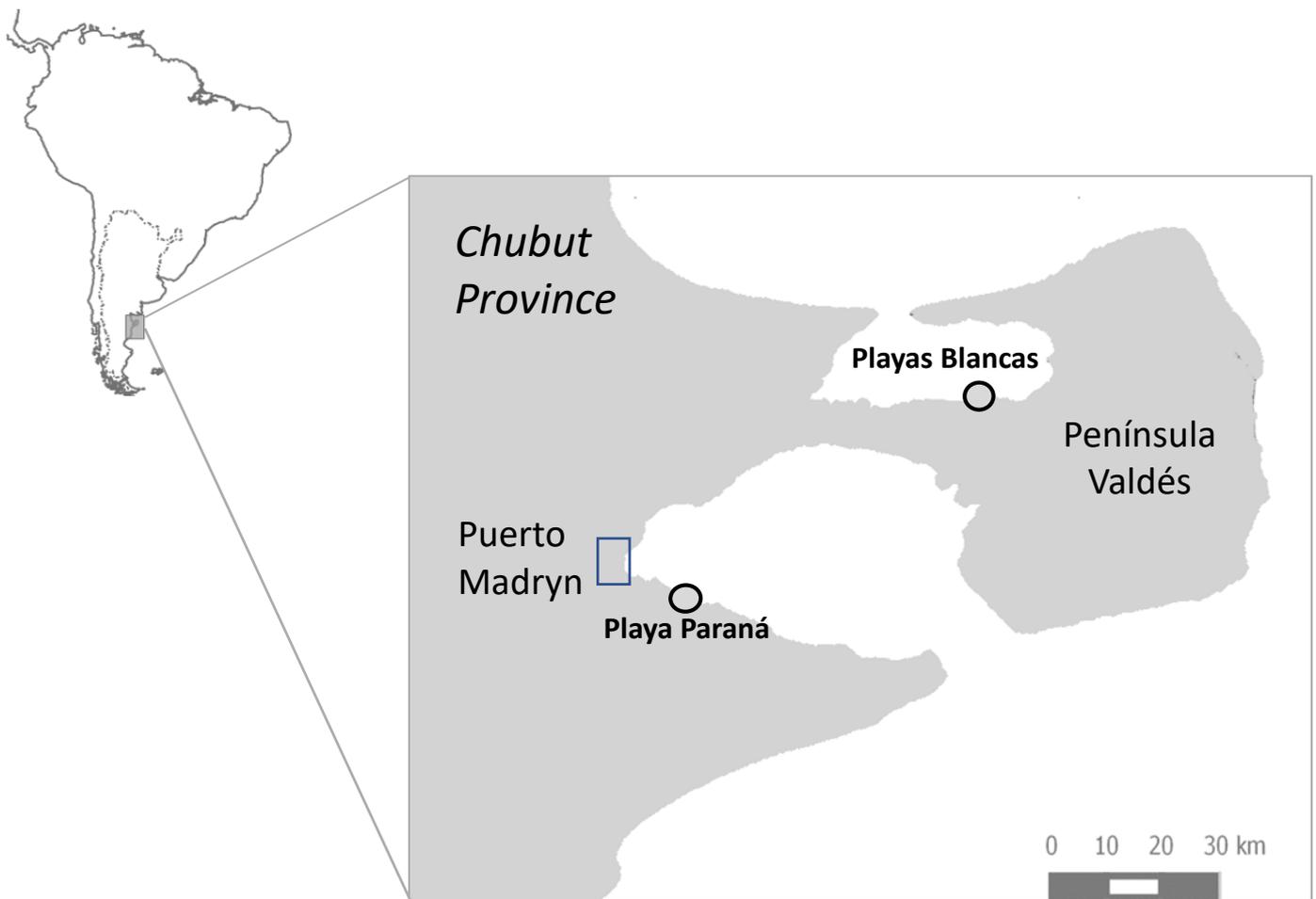


Figure 1. Map of the study area in Chubut province, Patagonia, Argentina. Playas Blancas is located in Península Valdés at 100 km and Playa Paraná 6 km from the city of Puerto Madryn (rectangle).

(García-Peña et al. 2009) are generally monogamous and have a biparental care strategy. Here, we report new data on banded Two-banded Plovers breeding in Chubut, northern Patagonia.

METHODS

We carried out fieldwork on two coastal areas in Chubut province, Patagonia, Argentina; Playas Blancas ($42^{\circ}42'S$, $64^{\circ}33'W$), a sandy beach located at Península Valdés and Playa Paraná ($42^{\circ}47'S$, $64^{\circ}56'W$), a gravel beach located close to the city of Puerto Madryn (Figure 1). We captured and banded adults on their nest using a rectangular trap of 40x20x20 cm during the breeding season between September and November 2016. Each captured plover was marked individually with an alphanumeric metal ring on the tarsus and an orange flag engraved with an alphanumeric code on the tibiotarsus.

We conducted resighting surveys 2–3 times weekly during the 2017 breeding season from September 2017 to January 2018 using 10x42 binoculars and documented sightings using digital cameras (Canon Rebel T4i) equipped with 100–300 mm f/4.5–5.6 USM telephoto zoom lenses. Surveys were made covering the whole breeding area in each site, which is approximately 55 ha in Playa Paraná where the tide amplitude is insignificant due to the strong slope (33 ha and 22 ha at the high and low tide, respectively). Whereas, the breeding area at Playas Blancas, a gentle slope beach, covers around 98 ha (9.5 ha during high tide and 88.5 ha during low tide). We recorded leg flag codes by photographing the

banded individuals (Figure 2 A–C), and then we classified resighted adults as: ‘breeders’, those plovers banded during 2016 and observed nesting in 2017, and ‘non-breeders’, those banded in 2016 and resighted, but where we could not confirm nesting during 2017, at least at the surveyed sites.

RESULTS

We captured and banded 11 adults in Playas Blancas and 13 in Playa Paraná in the 2016 breeding season. During 2017, we resighted 79.2% ($n = 19$) of the Two-banded Plovers banded in 2016 (Figure 3). Six resighted individuals (32%) were seen nesting at the same site they were banded, therefore, were classified as breeders. Thirteen individuals (68%) were observed solitary or in mixed small flocks with other shorebirds species within the study site. Of this, 10 individuals were seen in the area at least twice, but we did not observe any evidence of reproduction at the site they were banded and, therefore, we considered them non-breeders. Three individuals that were observed only once at the site, were considered of undetermined status (Table 1). Six individuals were resighted in Playas Blancas (two breeders, two non-breeders and two undetermined), whereas 12 were observed in Playa Paraná (four breeders, seven non-breeders and one undetermined). Most of the birds were resighted in the same beach site of their capture with the exception of two individuals banded at Playas Blancas in 2016 that were resighted at Playa Paraná in 2017 (Table 1). Two individuals that were paired with banded individuals during 2016, were



Figure 2. Two-banded Plovers (*Charadrius falklandicus*) in breeding plumage resighted in 2017 at Chubut province, Patagonia, Argentina. A) 01X at Playa Paraná (photo: Dallas Jordan). B) 05X at Playa Paraná (photo: Noé Terorde). C) 23X at Playas Blancas (photo: Darío Podestá).

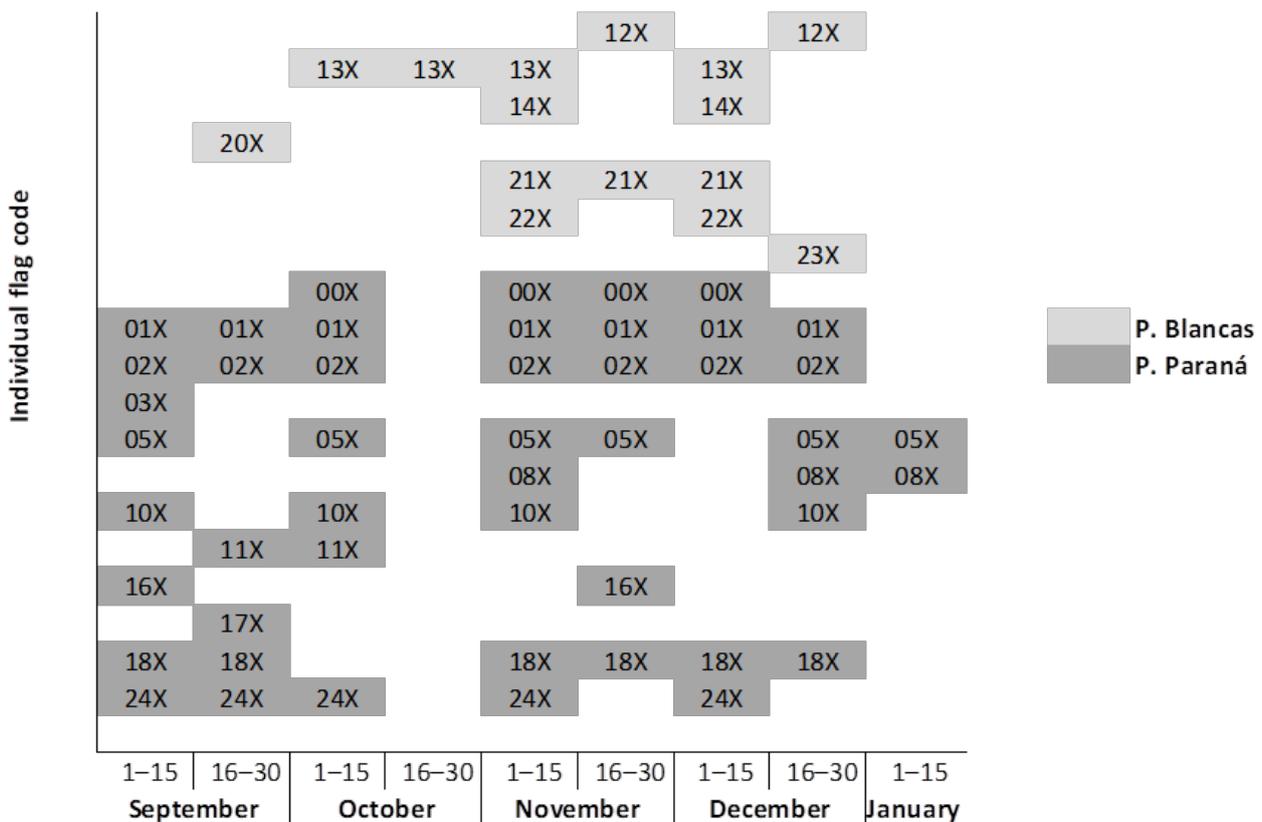


Figure 3. Temporal distribution of individually-marked Two-banded Plover (*Charadrius falklandicus*) individuals during the 2017 monitoring season (includes January 2018). The horizontal axis depicts the date in bi-weekly intervals, while the vertical axis separates different individual birds (numbers correspond to Table 1). Individuals resighted in Playas Blancas are depicted in light grey, and those resighted in Playa Paraná in dark grey.

observed during 2017 paired with a different banded individual (Table 1).

DISCUSSION

Our observations during the resighting surveys across the 2017 breeding season allowed us to record nearly 80% of the Two-banded Plovers banded the previous year, while the remaining 20% could not be resighted at any of the two study sites surveyed in this work. Resighting records at both beaches in 2017 showed that individuals comprise breeders, non-breeders, and individuals of unclear status. Although most of them were resighted at the same site, only a moder-

ate proportion (32%) effectively nested, the remaining (68%), were resighted resting or foraging, alone or in mixed flocks with Baird's Sandpipers (*Calidris bairdii*) and White-rumped Sandpipers (*Calidris fuscicollis*). A previous study examining the breeding dispersal of Two-banded Plovers between years in Chubut province showed that ~ 50% ($n = 33$) of the individuals banded in 2006 were resighted in the same site in 2007 (García-Peña et al. 2009). Therefore, our results are reinforcing the idea of site fidelity for the species in these beaches.

During 2017, the breeders registered early during the breeding season were observed resting and/or feeding in flocks and frequently displaying breeding behaviors (i.e., courtship vocalizations and territory defense; Bergstrom

Table 1. Records of Two-banded Plovers (*Charadrius falklandicus*) banded during 2016 and resighted during 2017 in Playa Paraná and Playas Blancas, Chubut province, Patagonia, Argentina. Resight status: B = breeder, NB = non-breeder, and UN = undetermined. Flag identification denotes the alphanumeric code on the orange flag of captured individuals. It also showed the breeding partner when the bird was captured in 2016 and resighted during 2017, UB = unbanded individual.

Banding site 2016	Resight site 2017	Nº of records	Resight status	Flag identification	Partner in 2016	Partner in 2017
Paraná	Paraná	10	B	01X	03X	08X
Paraná	Paraná	8	B	02X	UB	28X
Paraná	Paraná	9	B	05X	UB	UB
Paraná	Paraná	5	B	08X	24X	01X
Blancas	Blancas	2	B	14X	UB	UB
Blancas	Blancas	5	B	21X	UB	UB
Paraná	Paraná	4	NB	00X		
Paraná	Paraná	2	NB	03X	01X	
Paraná	Paraná	5	NB	10X		
Paraná	Paraná	4	NB	16X		
Paraná	Paraná	5	NB	24X	08X	
Paraná	Paraná	12	NB	18X		
Blancas	Blancas	3	NB	12X		
Blancas	Blancas	5	NB	13X		
Blancas	Blancas	3	NB	22X		
Blancas	Blancas	1	UN	20X		
Blancas	Blancas	1	UN	23X		
Blancas	Paraná	2	NB	11X		
Blancas	Paraná	1	UN	17X		

1988, Lanctot et al. 2000). They were seen later nesting close to the same portion of the beach or ‘territory’ as the previous year (GDH pers. observ.). As reported for Semipalmated Plovers (*Charadrius semipalmatus*), breeding in a familiar area may be beneficial (Flynn et al. 1999), and may also provide a meeting area to mate with previous partners (Choudhury 1995) or to form new pair bonds as we observed in our study site.

In two cases, Two-banded Plovers paired with a different partner in the subsequent year, despite the fact that the previous partner was still alive and in the area (Table 1). We could not confirm any cases of partners breeding together again during the following season, but many marked individuals were observed breeding with unbanded partners in both seasons. For the population breeding at the Malvinas (Falkland) Islands, the pattern seems different since at least 80% of the pairs showed mate fidelity among years (St. Clair 2010). If mate fidelity may reflect strong site tenacity as a result of habitat quality and stability (Aebischer et al. 1995), then ‘instability’ could result in lower mate retention (Flynn et al. 1999). In coastal areas affected by human activities, as in this study, birds could be forced to deal with more ‘unstable’ situations, and eventually breeding success and survival could be affected. This last is supported by data in Kentish Plovers (*Charadrius alexandrinus*), where the relatively unstable habitat coincides with lower rates of mate retention both within and among seasons (Székely & Lessells 1993). Hence, our study site Playa Paraná could be considered as an ‘unstable’ breeding environment for the Two-banded Plover, due to the impact of the human activity (circulation of motorized vehicles, pedestrians with dogs, bike riders, and fishermen) which also results in reduced nest

survival (Hevia et al. in prep.). However, more work is required to test whether such an impact could play a significant role in mate fidelity in this plover species.

Resighting records also revealed movements between both breeding sites across seasons. We detected two individuals, that were captured and banded in Playas Blancas, in Playa Paraná on the subsequent season. Similarly, García-Peña et al. (2009) reported movements of four adults banded at Playa Fracasso (also within Península Valdés, ~ 20 km northern of Playas Blancas) during 2006 and resighted the following year in Playa Paraná. Breeding grounds situated in Península Valdés are ~ 350 km away from Playa Paraná following the coastline, although in a straight line the distance is only ~ 65 km.

Summarizing, we present new data that complements previous studies on the breeding biology and movement of Two-banded Plovers in Chubut province, Argentina. While our observations reveal substantial site fidelity, more observations are required to determine the degree of mate fidelity in this population.

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REFERENCES

- Aebischer, NJ, GR Potts, & J C Coulson (1995) Site and mate fidelity of Shags *Phalacrocorax aristotelis* at two British colonies. *Ibis* 137: 19–28.
- Bergstrom, PW (1988) Breeding displays and vocalizations of Wilson's Plovers. *Wilson Bulletin* 100: 36–49.
- Blanco, D & P Canevari (1995) *Situación actual de los chorlos y playeros migratorios de la zona costera patagónica (provincias de Río Negro, Chubut y Santa Cruz). Humedales para las Américas*. Informe Técnico No. 3 (FPN-GEFPNUD-WCS). Plan de Manejo Integrado de la Zona Costera Patagónica, Buenos Aires, Argentina.
- Choudhury, S (1995) Divorce in birds: a review of the hypotheses. *Animal Behaviour* 50: 413–429.
- Flynn, L, E Nol & Y Zharikov (1999) Philopatry, nest-site tenacity, and mate fidelity of Semipalmated Plovers. *Journal of Avian Biology* 30: 47–55.
- García-Peña, EG, MA Hernández & LO Bala (2008) Ecología reproductiva del Chorlo de Doble Collar (*Charadrius falklandicus*) en Península Valdés, Argentina. *Ornitología Neotropical* 19 (Suppl.): 445–452.
- García-Peña, EG, MA Hernández, LO Bala & T Székely (2009) Breeding ecology and movements of Two-banded Plovers in Valdés Peninsula, Argentina (Appendix b). In García-Peña, EG (ed). *Phylogenetic comparative analyses of breeding systems and life-history strategies in shorebirds*. Ph.D. thesis, Univ. of Bath, Bath, UK.
- Hayman, P, J Marchant & T Prater (1986) *Shorebirds: an identification guide to the waders of the world*. Houghton-Mifflin, Boston, Massachusetts, USA.
- Hevia, GD (2013) *Éxito reproductivo del Chorlo de Doble Collar (Charadrius falklandicus) y recomendaciones para el manejo de su población en dos áreas protegidas próximas a Puerto Madryn, (Chubut, Argentina)*. Maestría en Manejo de Vida Silvestre, Centro de Zoología Aplicada, Univ. Nacional de Córdoba, Córdoba, Argentina.
- Lanctot, RB, BK Sandercock & B Kempenaers (2000) Do male breeding displays function to attract mates or defend territories? The explanatory role of mate and site fidelity. *Waterbirds* 23: 155–164.
- Maher, KH, LJ Eberhart-Phillips, A Kosztolányi, N dos Remedios, M C Carmona-Isunza, M Cruz-López, S Zefania, JJH St Clair, M Alrashidi, MA Weston, MA Serrano-Meneses, O Krüger, JI Hoffman, T Székely, T Burke & C Küpper (2017) High fidelity: extra-pair fertilisations in eight *Charadrius* plover species are not associated with parental relatedness or social mating system. *Journal of Avian Biology* 48: 910–920.
- St. Clair, JJH (2010) *Plovers, invertebrates and invasive predators: aspects of the ecology of some island populations*. Ph.D. thesis, Univ. of Bath, Bath, UK.
- St. Clair, JJH, P Herrmann, RW Woods & T Székely (2010) Female-biased incubation and strong diel sex-roles in the Two-banded Plover, *Charadrius falklandicus*. *Journal of Ornithology* 151: 811–816.
- Székely, T & CM Lessells (1993) Mate change by Kentish Plovers *Charadrius alexandrinus*. *Ornis Scandinavica* 24: 317–322.
- Villabriga, ML (2011) *Requerimientos y selección de hábitat reproductivo del Chorlo Doble Collar en playas cercanas a Puerto Madryn, Chubut, Argentina*. Tesis de Lic. en Biología, Universidad Nacional de la Patagonia San Juan Bosco, Puerto Madryn, Chubut, Argentina.
- Wiersma, P, GM Kirwan & P Boesman (2018) Two-banded Plover (*Charadrius falklandicus*). In del Hoyo, J, A Elliott, J Sargatal, DA Christie & E de Juana (eds). *Handbook of the birds of the world alive*. Lynx Edicions, Barcelona, Spain. Available from <https://www.hbw.com/node/53843> [Accessed 1 May 2018].
- Woods, RW (1988) *Guide to birds of the Falkland Islands*. Anthony Nelson, Oswestry, UK.

