Wader Study 125(2): xx–xx. doi:10.18194/ws.00110

Forum provides a platform for contributions from the wider community reporting particular aspects of wader/shorebird ecology and conservation, as well as previously unknown topics. These articles are subject to editor-only review. If you are interested in contributing to *Forum*, please contact the Editors-in-Chief at: *editor@waderstudygroup.org*.

The role of human compliance for management actions to protect breeding shorebirds in coastal ecosystems

Glenda D. Hevia[1,2] & Luis O. Bala[3]

[1]*Grupo de Ecofisiología Aplicada al Manejo y Conservación de Fauna Silvestre – Centro para el Estudio de Sistemas Marinos (CESIMAR), CCT CENPAT – CONICET, Bv. Brown 2915, Puerto Madryn, Chubut, Patagonia, Argentina*
hevia@cenpat-conicet.gob.ar
[2]*Universidad Nacional de Córdoba, Argentina*
[3]*Instituto de Diversidad y Evolución Austral (IDEAus), CCT CENPAT – CONICET*

Driven by the awareness that protection of shorebirds breeding on coastal ecosystems, including sandy, gravel, and mixed shores, very much depends on human behavior and that activities developed in breeding areas could be a substantial threat to many shorebird populations, we here review and discuss evidence of the effects of human disturbance on breeding shorebirds and the state of knowledge for management actions conducted to protect them. We also present a case study using symbolic fencing as a pilot management action at a key breeding ground for Two-banded Plovers *Charadrius falklandicus* in Patagonia, Argentina, and discuss from our learned lessons how testing human compliance could be improved. We also discuss the role of human compliance for the implementation of management techniques and how changing human behavior could play a key role in the management of habitats for breeding shorebirds, the very same areas used as recreation landscapes by humans. Lastly, we recommend that general clear communication and enforcement of rules are needed, but also education campaigns aimed at changing human attitudes are paramount for the protection of shorebird habitats in coastal ecosystems.

Keywords: *Charadrius falklandicus*, human behavior, human disturbance, management technique, symbolic fencing, Patagonia, Two-banded Plover

Located at the land-ocean interface, coastal ecosystems are highly vulnerable to human-mediated drivers of global change. For instance, coastal urbanization and the intense usage of beaches by humans can significantly influence life-history processes in coastal communities (Mead *et al.* 2013). Beaches have become large-scale recreational and tourism areas, mostly due to economic development and settlements along coastlines (Defeo *et al.* 2009, McLachlan *et al.* 2013), and since ecotourism activities have become more and more common, the human contact with wildlife turns out to be more frequent (Ikuta & Blumstein 2003). Therefore, temporary and generally non-lethal, but cumulative, effects of disturbance could be significant, including those activities that have the potential to change the behavior, abundance and distribution of wildlife (Lafferty *et al.* 2006). In birds, for example, human disturbance can cause the suspension or reduction of feeding time and quality by forcing birds away from suitable foraging habitats to less productive areas, and increasing the amount of energy spent on additional flights (Burger 1986, Brown *et al.* 2000). In some populations, the disruption of breeding behaviors by human disturbance, such as the interruption of incubation, might increase exposure of nests to predators and unfavorable weather (Boyle & Samson 1985, Weston & Elgar 2007).

Since beaches host diverse types of human recreationists, such as pedestrians with (unleashed) dogs, runners, cyclists, picnickers, fishermen, and many others, these areas can be considered 'recreation landscapes' (Liu *et al.* 2013). Such landscapes can involve both chronic impacts arising from structural transformation (e.g., loss of suitable habitat and connectivity due to building hotels or new roads) and the direct threat of anthropogenic high-

frequency disturbances (e.g., crushing of bird nests by motorized vehicles). In the case of breeding shorebirds, recreational human activities and motorized vehicle traffic on beaches can have direct impacts and contribute to changes in their population dynamics by affecting nesting success (e.g., Buick & Paton 1989, Boschert & Rupp 1993, Dowling & Weston 1999) or chick survival (e.g., Melvin *et al.* 1994, Ruhlen *et al.* 2003). Mobile humans (i.e., pedestrians and runners) may disrupt incubating birds for short periods (Weston *et al.* 2011). However, humans that stay close to nests could potentially interrupt incubation for extended periods (Burger 1986). Longer nest absences may increase thermal stress causing excessive cooling (Welty 1982) or heating of eggs (Bergstrom 1989). Besides, disturbance can not only raise the energy expenditure associated with nest defense (Lafferty *et al.* 2006) but also may reduce nest attentiveness drastically (Baudains & Lloyd 2007). Pedestrians can induce anti-predator responses including vigilance and early flight, which consequently have a negative effect on birds (Blumstein *et al.* 2005). Furthermore, the predation risk of clutches by avian or mammalian predators increases when incubating adults are off their nests (Bolduc & Guillemette 2003, Yasué & Dearden 2006). On ocean beaches studied by Weston and Elgar (2007) in southeastern Australia, nest absences of breeding adults can be caused both by human and non-human (i.e., raven and magpie) encounters. However, human stimuli were responsible for nearly 60% of disturbance-induced absences, being the greatest cause of time off nests (Weston & Elgar 2007).

MANAGEMENT ACTIONS CONDUCTED TO PROTECT BREEDING SHOREBIRDS

For decades, different types of management actions have been implemented to protect endangered shorebird species. Management to reduce or eliminate disturbance from recreational beach visitors ranges from the protection of individual nest sites to closures of entire beaches (e.g., Hill 1989). For example, the U.S. Fish & Wildlife Service (1994) published guidelines to beach managers and landowners for managing recreational activities in Piping Plover *Charadrius melodus* breeding habitat on the U.S. Atlantic Coast to avoid potential violations of the Endangered Species Act (Section 9) that could occur as the result of recreational activities on beaches also used by other species (such as Least Terns *Sternula antillarum*, Common Terns *Sterna hirundo*, American Oystercatchers *Haematopus palliatus*), their nests, and eggs. Prohibited acts include pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting such conduct (USFWS 1994). We discuss below two examples of management actions – symbolic fencing and temporary beach closure – that are relevant for the topic of this *Forum* because their effectiveness depends on human compliance.

Symbolic fencing: a pioneer protective measure

Along the U.S. Atlantic Coast, one of the innovative protective measures proposed to prevent direct mortality or harassment of Piping Plovers, their eggs, and chicks was the '*symbolic fencing*' technique (see Section III, USFWS 1994). The 'fence' consists of strings tied between posts driven into the sand, and signs placed on the posts with warning information and a picture or silhouette of a plover. The area behind the rope fence on the upper beach can create refuge areas for adults and chicks when the lower beach is used by large numbers of visitors (Melvin *et al.* 1991). Fencing also protects shorebirds incubating eggs by restricting access of pedestrians and vehicles, preventing nests from being stepped on or run over. This technique has been frequently used with slight variations to reduce human disturbance and trampling to nests, chicks or fledglings (e.g., Lafferty *et al.* 2006, Wilson & Colwell 2010). For instance, Lafferty *et al.* (2006) investigated the effects of beach recreation on Snowy Plovers *Charadrius alexandrinus nivosus* by comparing changes in the distribution, abundance and reproductive success following a management action to reduce human disturbance in Sands Beach, Coal Oil Point Reserve, Santa Barbara County, California, USA. During 2001–2004, across wintering and breeding seasons, they implemented a rope fence (boundary) of 400 m in a sandy beach where plovers were monitored daily. Rates of disturbance per plover/hour fell dramatically after protection; the remaining recreational disturbance was due to humans (92%), followed by dogs (8%). The mean abundance of plovers was higher during the months with fencing than before implementation. Results suggested that protection from disturbance improves breeding habitat and breeding success. Another example comes from Wilson and Colwell (2010) also with Snowy Plovers in California, USA. They studied the movements and the fledging success in a temporarily fenced area at Clam Beach, Humboldt County. Regarding the effectiveness of the fenced area, reproductive success increased within the protected area, and fledging success doubled compared to the same area when the fence was not placed; these rates decreased in unfenced areas on the north half of the same beach. Their findings strongly suggest that fencing with post signs can be used to enhance breeding success of threatened species in habitats with high human recreational activity.

Temporary beach closures: an alternative management action

In the late 1990s, Weston and Elgar (2007) collected data on responses of incubating Hooded Plovers *Charadrius rubricollis* to disturbance during their breeding seasons on coastal beaches in southern Australia and found that human stimuli (walkers) were the primary source of disturbance, decreasing the overall diurnal nest attendance substantially. Based on these findings, Weston *et al.* (2012) implemented '*temporary beach closures*', an alternative technique to symbolic fencing to alter human behavior and support the protection of beach-nesting Hooded Plovers. This management action consisted of a 50 x 25 m exclusion zone around a plover nest to reduce both disturbances to incubating plovers and inadvertent crushing of eggs by people. Signs, fences and wardens were the

three types of temporary beach closure configurations assessed. Levels of human compliance were high in all types of closure configurations (88.0–99.4%) and compliance was highest for females and lowest for young (<21 years) and older people (>60 years). This study concluded that any type of temporary beach closure configuration is meritorious and their use in recreational beaches will benefit breeding plovers by reducing the rate of egg-crushing. A similar management action was implemented in a key migratory stopover site for shorebirds on beaches of Delaware Bay in New Jersey, USA, and the effects of temporary beach closures on the various types of recreationists were assessed by examining visitation and compliance rates, and the response of shorebirds (Burger & Niles 2013). The majority of recreationists were anglers and walkers and most people visited the beach 1–6 times per month. Compliance (not entering the closed area) was nearly 100% because of monitoring by researchers and park police.

A CASE STUDY WITH TWO-BANDED PLOVERS IN PATAGONIA, ARGENTINA

Neotropical shorebirds inhabiting Patagonia breed, forage and rest in coastal ecosystems (Blanco & Canevari 1995). The Two-banded Plover *Charadrius falklandicus* is one of the little-known shorebird species in the region, widely distributed and endemic to southern South America (Wiersma *et al.* 2018). It is a regular breeder along intertidal and supra-littoral gravel beaches within the Chubut province in Patagonia; the breeding season extends from September to January (Hevia 2013). Nest survival, physiological parameters and site fidelity of breeding adults are currently the main topics under research (Hevia *et al.* unpubl. data).

In the spring of 2012, we tested for the first time 'symbolic fencing' to assess the level of compliance among beach visitors (recreationists), but also as an attempt to reduce human disturbance of adults or trampling nests in El Doradillo Natural Protected Area, located 20 km north of Puerto Madryn city (42.7˚S, 65.05˚W; Fig. 1). We selected a small portion of 'Las Canteras' beach that receives a vast number of visitors each year because it is one of the greatest places in the world to watch the Southern Right Whale *Eubalaena australis* from the shore (ANPED 2012). Also, it is one of the identified areas for Two-banded Plovers as a regular breeding ground (Garcia-Peña *et al.* 2008, Villabriga 2011, Hevia 2013).

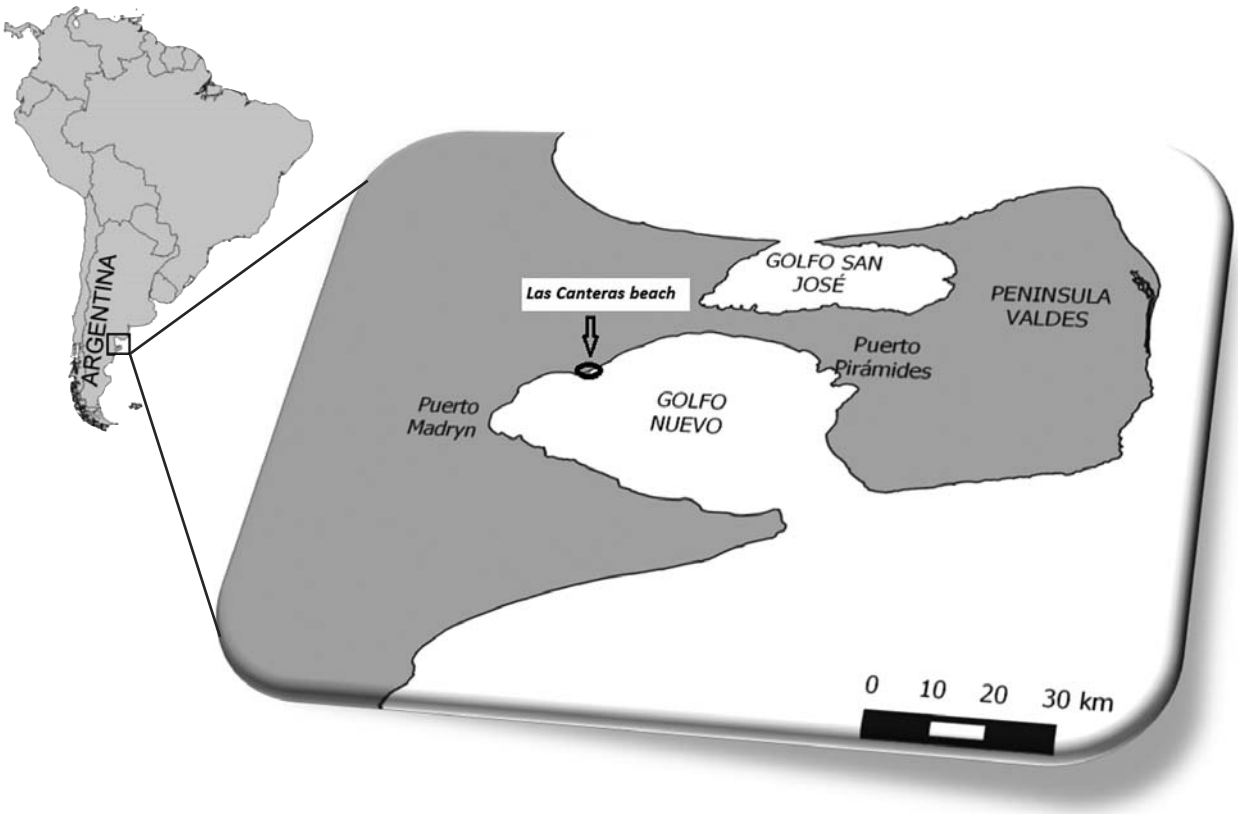

Fig. 1. Location of Las Canteras beach within El Doradillo Natural Protected Area, Puerto Madryn (Chubut, Argentina). Note the city of Puerto Madryn located 20 km south of Las Canteras beach.

CASE STUDY CONTINUED…

Symbolic fencing consisted of two fences with warning signs perpendicular to the shoreline to demarcate a restricted access area of 0.4 ha (Fig. 2). Fences were separated by 170 m with the upper tip ending in the steppe zone and the lower tip ending at the high tide line. Due to beach topography, the northern fence was 25 m long,

Fig. 2. Symbolic fencing implemented in 2012 at Las Canteras beach within El Doradillo Natural Protected Area, Puerto Madryn (Chubut, Argentina). **(A)** Schematic diagram showing both the northern (50 m) and southern (25 m) fences including the warning signs and posts. **(B)** One of the signs showing the warning message. **(C)** A park ranger digging a hole to place the post. **(D)** GDH attaching a fence to an ending tip of the steppe zone.

CASE STUDY CONTINUED…

and the southern fence was 50 m long. In the center of each fence we placed a post with a metal sign of 0.25 x 0.25 m with the information: '*Attention: Two-banded Plovers breeding here, please avoid walking*'. We preliminarily monitored the symbolic fencing during the third weekend of October 2012 from a stationary position located 30 m from the southern fence. Behavioral data were collected from 12:00 to 16:00, corresponding to the high tide and the peak of visitors watching the whales from the shore. We counted the number of recreationists and the type of behavior regarding the fence (crossed/did not cross) and the sign (read/did not read). We classified every recreationist as being compliant when they did not cross the fence, or non-compliant when they crossed and entered the demarcated area.

We recorded 37 recreationists in one weekend encountering the symbolic fencing. Behavioral attitudes demonstrated more compliance (62%, $n = 23$) than non-compliance (38%, $n = 14$). Within the compliant group, 16 recreationists did not read the sign and 7 read it. By contrast, within the non-compliant group (i.e., people who crossed the fence), 9 read the sign and 5 did not read it. Clearly, more compliant people did not read the sign, indicating that having the line is enough to fence a nesting area. However, signs at the parking area just before reaching the shore could be more effective than signs attached to the fence. This was a recommendation to beach managers in 2013, and it was implemented by park rangers in 2016, but without any assessment of its effects.

This exploratory measure of the level of compliance by recreationists toward the symbolic fencing was our first attempt to recognize the suitability and potential effectiveness of this type of management action on Two-banded Plover breeding grounds in Patagonia. Although we tried to record more behavioral observations in following weekends, we were forced to cancel further monitoring because both the fences and signs were stolen. Park rangers were usually present patrolling the area about 5–6 hours during daylight and high tides, but the area was frequently subject to vandalism when they were not present.

Another key lesson we learned was the need to: (1) record human behaviors using an extended observation schedule on the temporal scale of months, and (2) include several types of days (i.e., weekdays, weekends and holidays) for comparison. Besides, changes need to be made regarding the size of the warning signs; for example, by doubling their size, people might be able to more easily detect (>50 m) and read it (>10 m) from a long distance. At the same time, the type of material selected for posts and fences should be metal and heavy enough to dig it deep into the gravel to prevent theft and vandalism. Furthermore, the beach location and its topography (i.e., slope, distance to the high tide line, parking areas for vehicles) are also important aspects that could affect the detectability of the fences by people. Another relevant issue is the possibility to have park rangers or trained volunteers supporting the action; having assistance is crucial to collect data on recreationists' behavior toward the symbolic fencing. Likewise, we strongly believe that a well-implemented conservation program during the Two-banded Plover breeding season should include a combination of management actions: besides symbolic fencing, also temporary beach closures, more restrictive signs, reinforcement by increasing the park rangers' patrols, and strengthening of the control over people with unleashed dogs and the circulation of all-terrain vehicles.

FURTHER RESEARCH ON HUMAN COMPLIANCE TO ENHANCE SHOREBIRD PROTECTION

In addition to coastal management actions, studies are needed to identify different approaches to resolve bird-human conflicts. For instance, the human perception approach constitutes a growing cognitive research field to better understand behaviors and attitudes of people toward 'the world', referring to any object, place, event, or idea (Stufflebeam 2006). Thus, focusing on visitors' perceptions and recording the types of activity occurring at the beaches where shorebirds are breeding could be an important tool for conservation practitioners and should be included in management plans. A useful tool to explore perceptions of beach visitors is the implementation of attitudinal questionnaires by interview-guides, as employed by Jorgensen and Bomberger-Brown (2014) to evaluate the awareness of recreationists (including dog owners) at Lake McConaughy, USA and their attitude toward Piping Plovers and leash laws. They conducted personal interview surveys following observation periods across the plover breeding season and found that dog presence was higher on holidays and weekends, whereas leash-law compliance rates were chronically low during all periods examined. This perception approach highlights human behavioral attitudes and awareness, and may encourage beach managers toward promoting the coexistence between people and species of high concern (Meadow *et al.* 2005, McCleery *et al.* 2006, Weston & Elgar 2007). However, changing human behavior toward wildlife and their coastal ecosystems is a huge challenge since it requires sustained

efforts of education, communication, and enforcement (Lafferty 2001). Education campaigns and communication programs are often the preferred management tools for enhancing awareness but attempts to modify visitor beliefs and attitudes are more effective in the long term (Manning 2003), while law enforcement action seems to be more effective in temporarily resolving certain types of conflicts between humans and wildlife (Baruch-Mordo *et al*. 2013). Beach users have the power to pressure governments for promoting and implementing protection of beach-nesting birds, but deliberately involving various stakeholder groups leads to a more holistic, effective conservation program; for example, a multi-method education campaign proved to be a useful approach to beach users' perceptions in Pinellas County, Florida, USA (Ormsby & Forys 2010).

Applied conservation requires the knowledge from multi- and inter-disciplinary approaches, including social and natural sciences disciplines. For example, wildlife biologists and beach managers must work together to develop and implement multiple-use and long-term management strategies to enhance human compliance for the protection of breeding shorebirds and coastal ecosystems.

ACKNOWLEDGEMENTS

The case study summarized here was conducted by GDH as a framework for her thesis in *Wildlife Management,* a Master Program at the National University of Cordoba, Argentina (2011–2013), and it was partially financed by a co-fellowship from the Centro de Zoología Aplicada, Universidad Nacional de Córdoba (Argentina) and the U.S. Fish and Wildlife Service. GDH is very grateful to Maria B. Cabrera, director of El Doradillo Natural Protected Area and its park rangers for their support during fieldwork in 2012. Also, GDH thanks Verónica D'Amico for reviewing early drafts and Yvonne Verkuil for making critical and substantial suggestions for the manuscript.

REFERENCES

Área Natural Protegida El Doradillo (ANPED). 2012. *El lugar donde la Naturaleza te quiere conocer a vos*. Municipalidad de Puerto Madryn, PROFIP & BID, Argentina.

Baruch-Mordo, S., C.T. Webb, S.W. Breck & K.R. Wilson. 2013. Use of patch selection models as a decision support tool to evaluate mitigation strategies of human–wildlife conflict. *Biological Conservation* 160: 263–271.

Baudains, T.P. & P. Lloyd. 2007. Habituation and habitat changes can moderate the impacts of human disturbance on shorebird breeding performance. *Animal Conservation* 10: 400–407.

Bergstrom, P.W. 1989. Incubation temperatures of Wilson's plovers and Killdeers. *Condor* 91: 634–641.

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). In: *Humedales para las Américas*. PMIZCP: Informe Técnico No. 3 (FPN-GEFPNUD-WCS), Argentina.

Blumstein, D.T., E. Fernández-Juricic, P.A. Zollner & S.C. Garity. 2005. Inter-specific variation in avian responses to human disturbance. *Journal of Applied Ecology* 42: 943–953.

Bolduc, F. & M. Guillemette. 2003. Human disturbance and nesting success of Common Eiders: Interaction between visitors and gulls. *Biological Conservation* 110: 77–83.

Boschert, M. & J. Rupp. 1993. Brutbiologie des grossen Brachvogels *Numenius arquata* in einem Brutgebiet am südlichen Oberrhein. *Die Vogelwelt* 5: 199–221.

Boyle, S.A. & F.B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: a review. *Wildlife Society Bulletin* 13: 110–116.

Brown, S., C. Hickey & B.E. Harrington. 2000. *The U.S. Shorebird Conservation Plan*. Manomet Center for Conservation Sciences, Manomet, MA, USA.

Buick, A.M. & D.C. Paton. 1989. Impact of off-road vehicles on the nesting success of Hooded Plovers *Charadrius rubricollis* in the Coorong region of South Australia. *Emu* 89: 159–172.

Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in the Northeastern United States. *Environmental Conservation* 13: 123–30.

Burger, J. & L. Niles. 2013. Closure versus voluntary avoidance as a method of protecting migrating shorebirds on beaches in New Jersey. *Wader Study Group Bulletin* 120: 20–25.

Defeo, O., A. McLachlan, D.S. Schoeman, T.A. Schlacher, J. Dugan, … & F. Scapini. 2009. Threats to sandy beach ecosystems: a review. *Estuarine, Coastal & Shelf Science* 81: 1–12.

Dowling, B. & M.A. Weston. 1999. Managing a breeding population of the Hooded Plover *Thinornis rubricollis* in a high-use recreational environment. *Bird Conservation International* 9: 255–270.

Garcia-Peña, E.G., M.A. Hernández & L.O. Bala. 2008. Ecología reproductiva del Chorlo de Doble Collar (*Charadrius falklandicus*) en Península Valdés, Argentina. *Ornitología Neotropical* 19: 445–452.

Hevia, G.D. 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)*. Tesis de Maestría en Manejo de Vida Silvestre, Centro de Zoología Aplicada, Universidad Nacional de Córdoba, Argentina.

Hill, J.O., Jr. 1989. *Aspects of breeding biology of piping plovers in Bristol County, Massachusetts in 1988*. Lloyd Center for Environmental Studies, Report No. 89-3, South Dartmouth, MA, USA.

Ikuta, L.A. & D.T. Blumstein. 2003. Do fences protect birds from human disturbance? *Biological Conservation* 112: 447–452.

Jorgensen, J.G. & M. Bomberger-Brown. 2015. Evaluating recreationists' awareness and attitudes toward Piping Plovers (*Charadrius melodus*) at Lake McConaughy, Nebraska, USA. *Human Dimensions of Wildlife* 20: 367–380.

Lafferty, K.D. 2001. Birds at a Southern California beach: seasonality, habitat use and disturbance by human activity. *Biodiversity & Conservation* 10*:* 1949–1962.

Lafferty, K.D., D. Goodman & C.P. Sandoval. 2006. Restoration of breeding by snowy plovers following protection from disturbance. *Biodiversity & Conservation* 15: 2217–2230.

Liu, B., J. Su, J. Chen, G. Cui & J. Ma. 2013. Anthropogenic halo disturbances alter landscape and plant richness: A ripple effect. *PLoS ONE* 8: e56109.

Manning, R. 2003. Emerging principles for using information/education in wilderness management. *International Journal of Wilderness* 9: 20–27.

McCleery, R.A., R.B. Ditton, J. Sell & R.R. Lopez. 2006. Understanding and improving attitudinal research in wildlife sciences. *Wildlife Society Bulletin* 34: 537–541.

McLachlan, A., O. Defeo, E. Jaramillo & A.D. Short. 2013. Sandy beach conservation and recreation: guidelines for optimizing management strategies for multi-purpose use. *Ocean & Coastal Management* 71: 256–268.

Mead, A., C.L. Griffiths, G.M. Branch, C.D. McQuaid, L.K. Blamey & A.K. Whitfield. 2013. Human-mediated drivers of change: impacts on coastal ecosystems and marine biota of South Africa. *African Journal of Marine Science* 35: 403–425.

Meadow, R., R.P. Reading, M. Phillips, M. Mehringer & B.J. Miller. 2005. The influence of persuasive arguments on public attitudes toward a proposed wolf restoration in the Southern Rockies. *Wildlife Society Bulletin* 33: 154–163.

Melvin, S.M., C.R. Griffin & L.H. MacIvor. 1991. Recovery strategies for Piping Plovers in managed coastal landscapes. *Coastal Management* 19: 21–34.

Melvin, S.M., A. Hecht & C.R. Griffin. 1994. Piping plover mortalities caused by off-road vehicles on Atlantic coast beaches. *Wildlife Society Bulletin* 22: 409–414.

Ormsby, A.A. & E.A. Forys. 2010. The effects of an education campaign on beach user perceptions of beach-nesting birds in Pinellas County, Florida. *Human Dimensions of Wildlife* 15: 119–128.

Ruhlen, T.D., S. Abbott, L.E. Stenzel & G.W. Page. 2003. Evidence that human disturbance reduces Snowy Plover chick survival. *Journal of Field Ornithology* 74: 300–304.

Stufflebeam, R. 2006. *Introduction to the Methods Used to Study Perception*. The Mind Project (*mind.ilstu.edu*). Accessed 29 Aug 2018 at: *http://mind.ilstu.edu/curriculum/perception_intro/intro_to_methods_short.php*

United States Fish & Wildlife Service (USFWS). 1994. *Guidelines for managing recreational activities in Piping Plover (Charadrius melodus) breeding habitat on the U.S. Atlantic Coast to avoid take under Section 9 of the Endangered Species Act*. U.S. Fish and Wildlife Service, Northeast Region, USA.

Villabriga, M.L. 2011. *Requerimientos y selección de hábitat reproductivo del Chorlo Doble Collar en playas cercanas a Puerto Madryn, Chubut, Argentina*. Tesis de Licenciatura, Universidad Nacional de la Patagonia San Juan Bosco, Puerto Madryn, Chubut, Argentina.

Welty, J.C. 1982. *The Life of Birds*. Saunders College Publishing, Pennsylvania, USA.

Weston, M.A. & M.A. Elgar. 2007. Responses of incubating hooded plovers (*Thinornis rubricollis*) to disturbance. *Journal of Coastal Research* 23: 569–576.

Weston, M.A., G.C. Ehmke & G.S. Maguire. 2011. Nest return times in response to static versus mobile human disturbance. *Journal of Wildlife Management* 75: 252–255.

Weston, M.A., F. Dodge, A. Bunce, D.G. Nimmo & K.K. Miller. 2012. Do temporary beach closures assist in the conservation of breeding shorebirds on recreational beaches? *Pacific Conservation Biology* 18: 47–55.

Wiersma, P., G.M. Kirwan & P. Boesman. 2018. Two-banded Plover (*Charadrius falklandicus*). In: *Handbook of the Birds of the World Alive* (J. del Hoyo, A. Elliott, J. Sargatal, D.A. Christie & E. de Juana, Eds.). Lynx Ediciones, Barcelona, Spain. Accessed 1 May 2018 at: *https://www.hbw.com/species/*

Wilson, C.A. & M.A. Colwell. 2010. Movements and fledging success of Snowy Plover (*Charadrius alexandrinus*) chicks. *Waterbirds* 33: 331–340.

Yasué, M. & P. Dearden. 2006. The potential impact of tourism development on habitat availability and productivity of Malaysian plovers, *Charadrius peronii*. *Journal of Applied Ecology* 43: 978–989.