

CHALLENGES FOR MANAGEMENT AND CONSERVATION OF SANTA ROSA WETLAND (LIMA - PERU)

RETOS PARA EL MANEJO Y LA CONSERVACIÓN DE LOS HUMEDALES DE SANTA ROSA (LIMA-PERÚ)

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ABSTRACT

Wetlands in the central coast of Peru form an important corridor of biodiversity in the South American desert. One of these ecosystems is the wetland of Santa Rosa, located in Chancay (Lima). In recent years, the scientific community and the institutions responsible for the conservation of coastal wetlands have paid particular attention to this wetland. For the great diversity and importance of its flora and fauna, this wetland is a key ecosystem in the corridor of the central coast. Therefore, the conservation of this wetland in Lima is essential. Three steps are the key to the conservation of this ecosystem: a) recovering ownership of this wetland by legal processes, b) involving the local community in the conservation of this ecosystem and c) promoting synergy among the actors involved in the management of this conservation *hotspot*. These three aspects are discussed considering ecological and social aspects of this locality.

Keywords: wetland conservation, useful plants, bird diversity, Chancay, environmental conflicts

RESUMEN

Los humedales de la costa central del Perú forman un importante corredor de biodiversidad en el desierto sudamericano. Uno de estos ecosistemas es el humedal de Santa Rosa, ubicado en Chancay (Lima). En los últimos años, la comunidad científica y las instituciones responsables de la conservación de los humedales costeros han prestado especial atención a este humedal. Por la gran diversidad y la importancia de su flora y fauna, este humedal es un ecosistema clave en el corredor de la costa central; por lo tanto, su conservación es esencial. Tres pasos son la clave para la conservación de este ecosistema: a) la recuperación de la propiedad de este humedal por medio de procesos legales; b) la participación

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de la comunidad local en la conservación de este ecosistema; y c) promover la sinergia entre los actores involucrados en la gestión de esta conservación hotspot. Estos tres aspectos se discuten teniendo en cuenta los aspectos ecológicos y sociales del humedal Santa Rosa y sus alrededores.

Palabras clave: conservación, plantas útiles, diversidad de aves, Chancay, conflictos ambientales

INTRODUCTION

Wetlands are among the most important ecosystems on the planet. These ecosystems provide multiple goods and services to human populations that include the control of water flows, the regulation of global carbon levels, the provision of environments with cultural values, the provision of useful plants for human exploitation and habitats for hundreds of plants and animals uniquely adapted to these ecosystems (1).

Together with the lomas formations, coastal wetlands in Peru form a biological corridor integrated to the corridor of the Pacific. A total of 92 coastal wetlands have been recognized in Peru (56 natural wetlands, 11 artificial wetlands and 14 river mouths). From these wetlands, 25 are in Lima, (16 natural wetlands, four artificial wetlands and five river mouths) (2). Due to its proximity to urban areas, these coastal wetlands have been deeply impacted. Drain discharges from the surrounding populations, the addition of phosphates and nitrates as a result of the establishment of vegetable crops, the use of land for farming, and the use of aquifers for the use of the surrounding cities have been the most important sources of impact in the coastal wetlands from Lima (3–5).

The interest in the conservation of the coastal wetlands in Lima dates back to the days of the pre-Inca cultures up until the present year of the Republic, a period in which the rural population has used the goods and services from wetlands, and the survival of these populations has been closely linked to them. In 1991, an important wetland (Pantanos de Villa) was protected by the Metropolitan Municipality of Lima, and six years later this wetland became a Ramsar site. After Pantanos de Villa, little attention has been paid to other localities. In recent decades, efforts of the Regional Government of Lima (GORE-Lima) have allowed the protection of other wetlands as the Albuferas de Medio Mundo (a Regional Conservation Area, RCA) and the lagoons of El Paraíso (that is in the process of categorization as an RCA). Also, the Regional Government of Callao, together with the Municipality of Ventanilla, has protected the Ventanilla wetlands (in Callao, province of Lima).

The wetland of Santa Rosa has recently received attention from the local and scientific community. Thanks to the efforts of the GORE-Lima, the Municipality of Chancay (District of Lima) and its Municipal Environmental Commission, and various efforts by the scientific community, it has been able to perform multiple assessments and studies to know the flora and fauna as well as the ecological relationships in the biota of this ecosystem

THE WETLANDS OF SANTA ROSA AND ITS BIODIVERSITY

The Wetland of Santa Rosa is located in the district of Chancay, Huaral province in the department of Lima between zero and twenty meters above sea level (Fig. 1). It has an area of 60 hectares. This wetland is surrounded in the north by low-lying hills from Cerro Salinas. In the western

and the southeastern side limits with the Pacific Ocean (El Cascajo beach) and in the eastern side delimits with agricultural areas belonging to the town of Peralvillo and Cerro Salinas. According to the classification of wetlands proposed by the RAMSAR convention, the wetlands of Santa Rosa and their related habitats is type 8(H) (swamps and marshes, includes marshes and flooded areas with salty water lakes, meadows, freshwater areas and tidal brackish) and also corresponds to the type 10(J) (coastal lakes with salty water, with at least a small connection with the ocean).

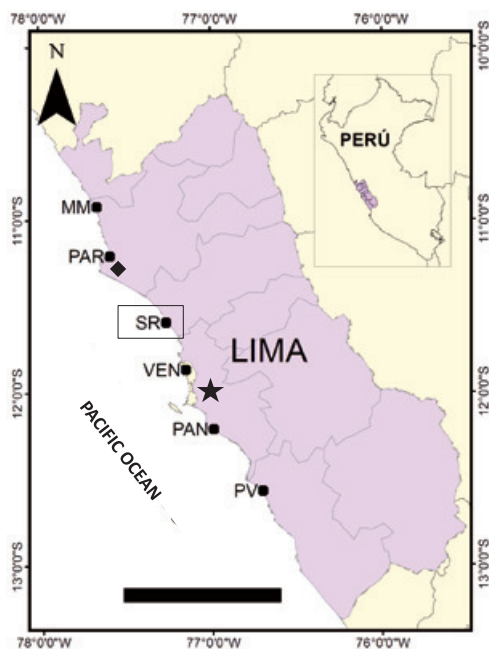


FIGURE 1. WETLANDS IN THE CENTRAL COAST OF PERU. MM = ALBUFERA OF MEDIO MUNDO, PAR = LAKE EL PARAÍSO, SR = SANTA ROSA WETLAND, VEN = VENTANILLA WETLANDS, PAN = PANTANOS OF VILLA, PV = PUERTO VIEJO WETLANDS, ◆ = LOMAS OF LACHAY, ★ = CITY OF LIMA. SCALE = 100 KM.

This wetland is one of the most diverse wetlands in the coast of Lima. It has a total of 67 species of vascular plants, 50% of which (34 species) are casual type species (non-native and invasive crop) introduced by human activities (5). Of the reported plant species, 31 species

are considered useful plants, dominated by medicinal herbs, ornamental plants and forage plants, the 57% of them (17 species) are used in Perú (5–8), eight are used by people living around Santa Rosa wetland (Table 1.). Nowadays, this wetland is the first wetland in plant diversity (67 species reported) and at the same time has the lowest area, compared with other important wetlands in the coast of Lima (as Pantanos of Villa, Albuferas of Medio Mundo and Lake El Paraíso (9,10). It is important to consider that fifty percent of its plant diversity consists of invasive species, so the floristic diversity is not only due to the abundance of native plants, but to the ecosystem's ability to maintain balance despite the introduction of non-native species to the area. Plant invasions are frequent in wetlands, specially because of the accumulation of sediments and nutrients, affecting nutrient cycling and the food webs (11). Little is known of the effects of invasive species in Santa Rosa Wetland, but the low abundance of invasive species in the wetland reveals its great resilience. The landscape of this wetland is composed by typical plant communities of the coastal wetlands of Lima (as the communities composed by *Typha latifolia* called "totoraes" and communities of aquatic plants as *Pistia stratiotes*) and specific plant communities derived of the interaction between the wetland and agriculture and farms (for example, those described as "vega mixta", composed by the presence of invasive species and native species as *Schoenoplectus americanus*, *Sarcocornia neei* and *Distichlis spicata*) (11). The agriculture activities around the lake increase the nutrients in the water, causing the increase of floating plants populations (for example *Eichhornia crassipes*, *Pistia stratiotes* and *Lemna gibba*) that cover completely the lake, changing the ecological conditions (as productivity) on the water body. The diversity and composition of plants

TABLE 1. USEFUL PLANTS OF SANTA ROSA WETLAND. TABLE PREPARED USING THE LIST OF PLANTS OF RAMÍREZ ET AL. 2010 AND THE INFORMATION FROM USDA ET AL. (2012), LEÓN ET AL. 1998, AND RUTTER, 1990. OR=ORNAMENTAL, A=FOOD, C=RAW MATERIAL AND CONSTRUCTION, I=POLLUTION INDICATOR, MR=HEAVY METAL REMOTION, F=FORRAGE, ER=EROSION CONTROL, MD=MEDICINAL, RV=REVEGETATION, CB=FUEL, B=FERTILIZER, AC=ESSENTIAL OILS, REL=RELIGIOUS USE, LW=LAWN. *=USE IN PERU, SR =USE IN SANTA ROSA WETLAND.

FAMILIA / ESPECIE	USDA et al.	León et al.	Rutter
<i>Adiantum digitatum</i> Hook.		OR*	
<i>Ambrosia artemisiifolia</i> L.	MD		MD*
<i>Arundo donax</i> L.	OR/CB/C/MD	C*/I/OR	C*/MD*
<i>Azolla filiculoides</i> Lam.	OR/F/B	I/MR/B	
<i>Bacopa monnieri</i> (L.) Wettst.	OR/MD		
<i>Chenopodium murale</i> L.	MD		
<i>Colocasia esculenta</i> (L.) Schott	OR ^{sr} /AF/A/MD		A*
<i>Cynodon dactylon</i> (L.) Pers.	ER/LW/F/MD	F*/ER*/MD*	F*/MD*
<i>Cyperus articulatus</i> L.	ER/AC/FB/MD/REL		REL*
<i>Distichlis spicata</i> (L.) Greene	ER		
<i>Eclipta prostrata</i> (L.) L.	MD		
<i>Eichhornia crassipes</i> (Mart.) Solms	OR/B	F ^{sr} /I/MR/OR	OR*
<i>Heliotropium curassavicum</i> L.	MD		MD*
<i>Lemna gibba</i> L.	A/F	F/I/MR	
<i>Ludwigia peruviana</i> (L.) Hara	OR		A*
<i>Mentha spicata</i> (L.)	A/AC/MD		
<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	OR	OR*	
<i>Oxalis corniculata</i> L.	MD		
<i>Paspalidium geminatum</i> (Forssk.) Stapf	F ^{sr}	I	
<i>Paspalum conjugatum</i> P.J. Bergius	F ^{sr}		F*, ^{sr}
<i>Paspalum lividum</i> Trin. ex Schtdl.	B		
<i>Paspalum vaginatum</i> Sw.	ER/LW/RV	F* ^{sr} /ER	
<i>Pistia stratiotes</i> L.	OR/F ^{sr} /CB	MR/I/OR*	OR*/MD*
<i>Plantago major</i> L.	MD		MD*
<i>Rumex crispus</i> L.	MD		
<i>Rumex obtusifolius</i> L.	MD		
<i>Schoenoplectus americanus</i> (Pers.) Volkart ex Schinz & R. Keller	ER/FB ^{sr}	FB* ^{sr}	
<i>Sesuvium portulacastrum</i> (L.) L.	OR/RV		
<i>Solanum americanum</i> Mill.	A		MD*
<i>Tessaria integrifolia</i> Ruiz & Pav.			
<i>Typha domingensis</i> Pers.	FB/MD	F* ^{sr} /I	

communities in this wetland reveal that a) there is an important impact of human activities to plant species composition and b) plant communities in this wetland seem to have great resilience to these impacts.

Bird diversity is another important group that has been studied in recent years. It has been reported a total of 73 bird species, 72% of them were resident species, 21% migrate to the boreal

region, 3% to the austral region and 4% to the Andes (12,13). Within this group of species there are threatened species (*Phalacrocorax bougainvillii* "chuita" and *Pelecanus thagus* "pelicano peruano"), endemic species (*Geositta peruviana* "pampero peruano", which belong to the endemic area of the Pacific Coast of Peru and Chile), two species belong to the Annex 2 of the Convention on International Trade of Endangered Species (CITES) (*Pandion haliaetus*

TABLE 2. SURFACE, BIRD HISTORIC RICHNESS AND REPORTS PER AREA OF SIX WETLANDS IN THE CENTRAL COAST OF PERU. ¹SERNAMP 2012; ²TERRA NUOVA AND PROCOMCCH 2009; ³ALVAREZ AND IANACONE 2008; ⁴JIMÉNEZ AND ALCÁNTARA 2006; ⁵JIMÉNEZ ET AL., 2012.

WETLAND	SURFACE (HA)	HISTORIC RICHNESS	REPORTS PER AREA (SPECIES / HA)
Pantanos de Villa ¹	263,27	202	0,77
Albuferas de Medio Mundo ²	687,71	72	0,11
Lake El Paraíso ²	674,5	106	0,15
Ventanilla Wetland ³	275,45	78	0,28
Puerto Viejo Wetland ²	275,81	72	0,26
Santa Rosa Wetland ^{4,5}	60	73	1,22

“aguila pescadora” and *Falco sparverius* “cernícalo americano”) and several migratory species of the families Laridae, Scolopacidae y Charadriidae. Because of its location, this wetland maintains the connectivity between the Peruvian wetlands and the Mesoamerican Biological Corridor, favoring biological and genetic dispersal among coastal wetlands. Secondly, this location allows the cross connectivity across the basin of Chancay-Huaral where there is a lagoon system with a diversity of birds (mainly Anatidae). Despite having a smaller area compared to other wetlands of Lima, Santa Rosa wetland presents a greater bird species richness (compared to wetlands of Puerto Viejo and Medio Mundo) and density (14–16) (Table 2). All this information shows that Santa Rosa wetland is an important ecosystem for the residence, passage and alimentation of birds in the pacific coast.

KEY STEPS FOR THE CONSERVATION OF SANTA ROSA WETLAND

One of the main challenges for the conservation of this wetland is to recover the legal property of the area. Three families have a title over 90% of the wetland. This title was obtained

from contracts with the Agency for the Formalization of Informal Property (COFOPRI) during the 90’s considering that the land was suitable for agriculture and housing construction. Unfortunately, the legal owners do not have interest in collaborating with the management and research initiatives in the area. The recovery of the property is a feasible process with Government through the GORE-Lima and the Municipality of Chancay. At the same time it is important to raise awareness among owners to collaborate with the wetland conservation. This area is being used for agriculture and livestock, which are always affected by floods from the water system of this wetland. This situation forces the people to use a drainage system, which is an improper, costly and high impact practice in this kind of ecosystems. Alternative economic activities are the sustainable use of *Schoenoplectus americanus* (as a source of raw material for building crafts), *Eichhornia crassipes* (which is used as forage), or other useful plants which are abundant resources in the area.

Possession of land is a problem of several wetlands on the coast of Lima as Pantanos of Villa and wetlands of Puerto Viejo, where the cooperation of the owners for the conservation and

management of these wetlands has been achieved, despite failing to recover the property. The recovery of the property, hand in hand with the consciousness of the owners, is a key step to ensure the viability of any plan of management of this ecosystem. The Master Plan for this wetland (to be considered as an ACR) has been worked by the GORE-Lima, and a municipal ordinance has been written (the OM-016-2005 which declared Santa Rosa wetland as ecological area). These documents should allow the regulation of the activities taking place in this ecosystem and a faster recovery of the property.

The second step is to involve the local community and the media to spread the importance of this wetland. The GORE-Lima has been working with the population (not owners, which refused to assist) that has been very willing to participate in the protection of this area. For the important diversity of birds and the landscape, Santa Rosa Wetland should be used as a tourist center and for bird watching, which, by its location, could be included within an ecological circuit or tourist itineraries including the Lake El Paraíso (very interesting for bird watching) and Lomas of Lachay (a seasonal ecosystem well known in Lima) which are natural areas very close to Santa Rosa wetland (Fig. 1). Santa Rosa wetland is now part of touristic circuits in the district of Chancay, but not massively, so very little is known about this wetland in Lima. The local community should be involved in the management of these tourist services, in this way they would see a direct benefit from the conservation of this ecosystem. To enable people to actively participate in these alternative activities it will be necessary the training and development of touristic projects and broadcast. Non-governmental organizations (NGO), the Municipality of Chancay and the GORE-Lima will play a fundamental role in this key step.

The third key step is to achieve synergy among management actors. Over time many entities have worked to preserve and study these environments; however there have not been joint work between them. Individual works of the different actors of management have achieved a long list of agreements that support the conservation of this and other wetlands in the coast of Lima, so the protection and sustainable use of wetlands has legal tools to be justified. Some entities capable of handling major financing resources have decided not to get involved in protecting wetlands in Peru for political reasons. Some researchers who work in this wetland do not publish or share their information. There is no a proper link between the scientific community and civil society, leading to misinformation and ignorance. The breakdown of these barriers is critical in order to continue with the management of Santa Rosa wetland and other wetlands in the coast of Peru. To manage successfully these ecosystems, the synergism between the state, NGO's and the scientific community will be fundamental.

ACKNOWLEDGEMENTS

We thank John Flores for their help in preparing the map of the study area. We thank Christian Monsalve, César Pacherrres, Juan José Aponte and Blanca León for the revision of this document. We are grateful for the continued support of the NGO Terra Nuova. Finally, we thank the valuable suggestions of the anonymous reviewer.

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RECIBIDO: 28/11/12
ACEPTADO: 12/12/12

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FE DE ERRATAS

En la Tabla 1 del artículo “Challenges for management and conservation of Santa Rosa wetland (Lima - Perú)”, de nuestra edición anterior (Científica Volumen 9 - Número 3, página 260), se ha deslizado un error: la asignación MD* (MEDICINAL) debió anotarse en la línea que corresponde a *Tessaria integrifolia* Ruiz & Pav. La tabla completa y corregida se muestra a continuación:

TABLE 1. USEFUL PLANTS OF SANTA ROSA WETLAND. TABLE PREPARED USING THE LIST OF PLANTS OF RAMÍREZ ET AL. 2010 AND THE INFORMATION FROM USDA ET AL. (2012), LEÓN ET AL. 1998, AND RUTTER, 1990. OR = ORNAMENTAL, A = FOOD, C = RAW MATERIAL AND CONSTRUCTION, I = POLLUTION INDICATOR, MR = HEAVY METAL REMOTION, F = FORRAGE, ER = EROSION CONTROL, MD = MEDICINAL, RV = REVEGETATION, CB = FUEL, B = FERTILIZER, AC = ESSENTIAL OILS, REL = RELIGIOUS USE, LW = LAWN. * = USE IN PERU, SR = USE IN SANTA ROSA WETLAND.

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<i>Ambrosia artemisiifolia</i> L.	MD		MD*
<i>Arundo donax</i> L.	OR/CB/C/MD	C*/I/OR	C*/MD*
<i>Azolla filiculoides</i> Lam.	OR/F/B	I/MR/B	
<i>Bacopa monnieri</i> (L.) Wettst.	OR/MD		
<i>Chenopodium murale</i> L.	MD		
<i>Colocasia esculenta</i> (L.) Schott	OR ^{sr} /AF/A/MD		A*
<i>Cynodon dactylon</i> (L.) Pers.	ER/LW/F/MD	F*/ER*/MD*	F*/MD*
<i>Cyperus articulatus</i> L.	ER/AC/FB/MD/REL		REL*
<i>Distichlis spicata</i> (L.) Greene	ER		
<i>Eclipta prostrata</i> (L.) L.	MD		
<i>Eichhornia crassipes</i> (Mart.) Solms	OR/B	F ^{sr} /I/MR/OR	OR*
<i>Heliotropium curassavicum</i> L.	MD		MD*
<i>Lemna gibba</i> L.	A/F	F/I/MR	
<i>Ludwigia peruviana</i> (L.) Hara	OR		A*
<i>Mentha spicata</i> (L.)	A/AC/MD		
<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	OR	OR*	
<i>Oxalis corniculata</i> L.	MD		
<i>Paspalidium geminatum</i> (Forssk.) Stapf	F ^{sr}	I	
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<i>Paspalum lividum</i> Trin. ex Schldt.	B		
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<i>Schoenoplectus americanus</i> (Pers.) Volkart ex Schinz & R. Keller	ER/FB ^{sr}	FB ^{sr}	
<i>Sesuvium portulacastrum</i> (L.) L.	OR/RV		
<i>Solanum americanum</i> Mill.	A		
<i>Tessaria integrifolia</i> Ruiz & Pav.			MD*
<i>Typha domingensis</i> Pers.	FB/MD	F ^{sr} /I	

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