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Population Status of American Oystercatchers (*Haematopus palliatus frazari*) Breeding in Northwest Mexico

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Abstract.—The western race of the American Oystercatcher (*Haematopus palliatus frazari*) is a resident and endangered shorebird of western Mexico. Its breeding population and conservation concerns are poorly known, but recent information indicates extremely low numbers and a discrete breeding distribution. Because of loss and degradation of sandy beaches by coastal development and disturbance from human recreational activities, the American Oystercatcher is a priority species in the Shorebird Conservation Plans of the United States and Mexico. Research on its distribution and abundance during the 2009 breeding season resulted in the identification of 2,286 adults in northwest Mexico. Although the population is higher than previous estimates, its distribution is more restricted than expected. It is distributed almost exclusively in northwest Mexico, and 80% of the total breeding population is found on the islands of Sinaloa and Baja California Sur. Based on these results, this species was officially federally listed on the Mexican List of Protected Species in 2010. This legal mechanism will promote the management and protection of this priority subspecies as well as other waterbirds occupying the same habitats. Received 31 July 2015, accepted 18 March 2016.

Key words.—breeding population, discrete distribution, islands, sandy habitat, threats.

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The American Oystercatcher (*Haematopus palliatus*) is a large and charismatic shorebird that inhabits sandy beaches, islands and coastal wetlands in temperate and subtropical regions of the Western Hemisphere (Nol and Humphrey 1994). Two subspecies are recognized for North America, *H. p. palliatus* and *H. p. frazari*. The nominate subspecies *H. p. palliatus* is distributed along the eastern and southern coasts of the United States, eastern coast of Mexico, Pacific and Caribbean coasts of Central America, northern and eastern coasts of South America, and throughout the Caribbean (Clay *et al.* 2010). The subspecies *H. p. frazari* is resident on both coasts of the Baja California peninsula, in the islands of the Gulf of California, and along the western coast of Mexico (Howell

and Webb 1995; Clay *et al.* 2010). There is concern for the population viability of this subspecies, as recent surveys indicate a low population size with a small breeding range restricted to northwest Mexico. Therefore, this subspecies is federally listed as endangered in Mexico (Secretaría de Medio Ambiente y Recursos Naturales 2010). Morrison *et al.* (2001) estimated a total of 350 birds based on aerial surveys made along the Pacific coast of Mexico. However, winter ground surveys at two sites in the Baja California peninsula revealed 458 individuals at Guerrero Negro (Carmona *et al.* 2011) and 287 at Laguna San Ignacio (Mendoza and Carmona 2013), plus 121 on the Colorado River Delta (Morrison and Ross 2009). Based on these surveys, its total population size has

been roughly estimated at 3,000 individuals (Clay *et al.* 2010, 2014). However, prior to this work there have been no comprehensive surveys of the American Oystercatcher breeding population in northwest Mexico.

Little is known about the ecology and conservation issues of the subspecies *H. p. frazari*, both in the breeding and the non-breeding season (Nol and Humphrey 1994). This population is vulnerable due to loss and degradation of their nesting sites by tourist-related development and human disturbance (Amador *et al.* 2008; Clay *et al.* 2010; Galindo-Espinosa and Palacios 2015), and to the degradation of their foraging habitat by changes in land use for constructing marinas and ponds for shrimp farming (Berlanga-Robles and Ruiz-Luna 2006; Berlanga-Robles *et al.* 2011).

We undertook a comprehensive survey to assess the population status of the American Oystercatcher in northwest Mexico, and determine the most important areas and types of habitats being used. Here, we provide an overview of the breeding distribution and abundance of the *H. p. frazari* subspecies of the American Oystercatcher in northwest Mexico.

METHODS

Study Area

Northwest Mexico includes the states of Sonora, Sinaloa, Nayarit, Baja California, and Baja California Sur, as well as the Gulf of California and Pacific Ocean islands (Fig. 1). Sonora and Baja California share the area of the Colorado River Delta, and it was included as a separate area. The northern boundary marks the border with the United States and the southern limit of the study area is Bahía de Banderas, Jalisco. The west coast of the Baja California peninsula contrasts with the east coast, having a wider continental shelf. The western margin of the mainland is distinguished by a wide continental shelf, with maximum amplitude in the northern Gulf of California, where the Colorado River Delta is located.

The study area encompassed four biogeographic provinces of Mexico (Morrone *et al.* 2002). Three of these provinces are located in the Nearctic Region (California, Baja California, and Sonora), and one is located in the Neotropical Region (Mexican Pacific Coast).

The climate is largely a desert climate with extremely low rainfall occurring in high-intensity, late-summer storms or during low-intensity, winter storms. Accord-

ing to García (2004), the region includes three climate categories: 1) The Mediterranean climate, which is the mild climate associated with Europe's Mediterranean coast as well as the California coast. The northwest corner of Baja California is the only part of Mexico with this type of climate. This area is relatively arid and gets less than 400 mm of rain a year; it is unique in Mexico, being the only place that is dry in summer and gets rain only in winter. 2) Arid (desert) climate that usually receives less than 250 mm of rain a year. In northwest Mexico, dry desert areas include most of Baja California and western Sonora. 3) The tropical wet-and-dry category has a pronounced dry season. The dry winter months typically get less than 40 mm of rain, compared to over 150 mm in each of the summer months. Much of coastal Mexico, stretching from Nayarit along the Pacific coast all the way to Guatemala, is in this category.

Surveys

We conducted a comprehensive search of published and unpublished literature and had local biologists across northwest Mexico make inquiries on the abundance and distribution of American Oystercatchers on the west coast of Mexico. We also reviewed maps and satellite images. From this review, we selected locations with known and potential nesting habitat for American Oystercatchers along seven Bird Conservation Regions, as described by the North American Bird Conservation Initiative: Coastal California, Sonoran Desert, Desert of Baja California, Gulf of California Islands, Sierra and Lowlands of Cabo, Pacific Lowlands, and Marismas Nacionales (Sonoran Joint Venture Technical Committee 2006).

Potential breeding habitat types in northwest Mexico included sandy beaches, barrier beaches, rocky beaches, salt marshes and mangroves (*Rhizophora mangle*, *Avicennia germinans*, and *Laguncularia racemosa*), island/sandy, island/rocky, island/shell, and ponds (saltworks and shrimp (*Litopenaeus vannamei*) ponds).

During the 2009 breeding season, we conducted a comprehensive American Oystercatcher breeding survey at 149 locations along the coasts of the five states of northwest Mexico, the islands in the Gulf of California and at Islas Todos Santos off western Baja California. Breeding population surveys included all 12 sites of the Western Hemispheric Shorebird Reserve Network (WHSRN) in northwest Mexico (Western Hemisphere Shorebird Reserve Network 2015).

We conducted the fieldwork mainly during May and June, although the survey period included April through July. In the survey protocol, we defined this period because American Oystercatchers start defending territories in March, but the earliest nests occur in April and the latest adults observed feeding young near breeding sites are in July and August, especially in the northern part of the region (Laguna Ojo de Liebre, Baja California Sur) (E. Palacios, unpubl. data). We surveyed known and potential locations in teams of two observers each, during daylight hours, usually from 09:00 hr through 17:00 hr, and regardless of tide condi-

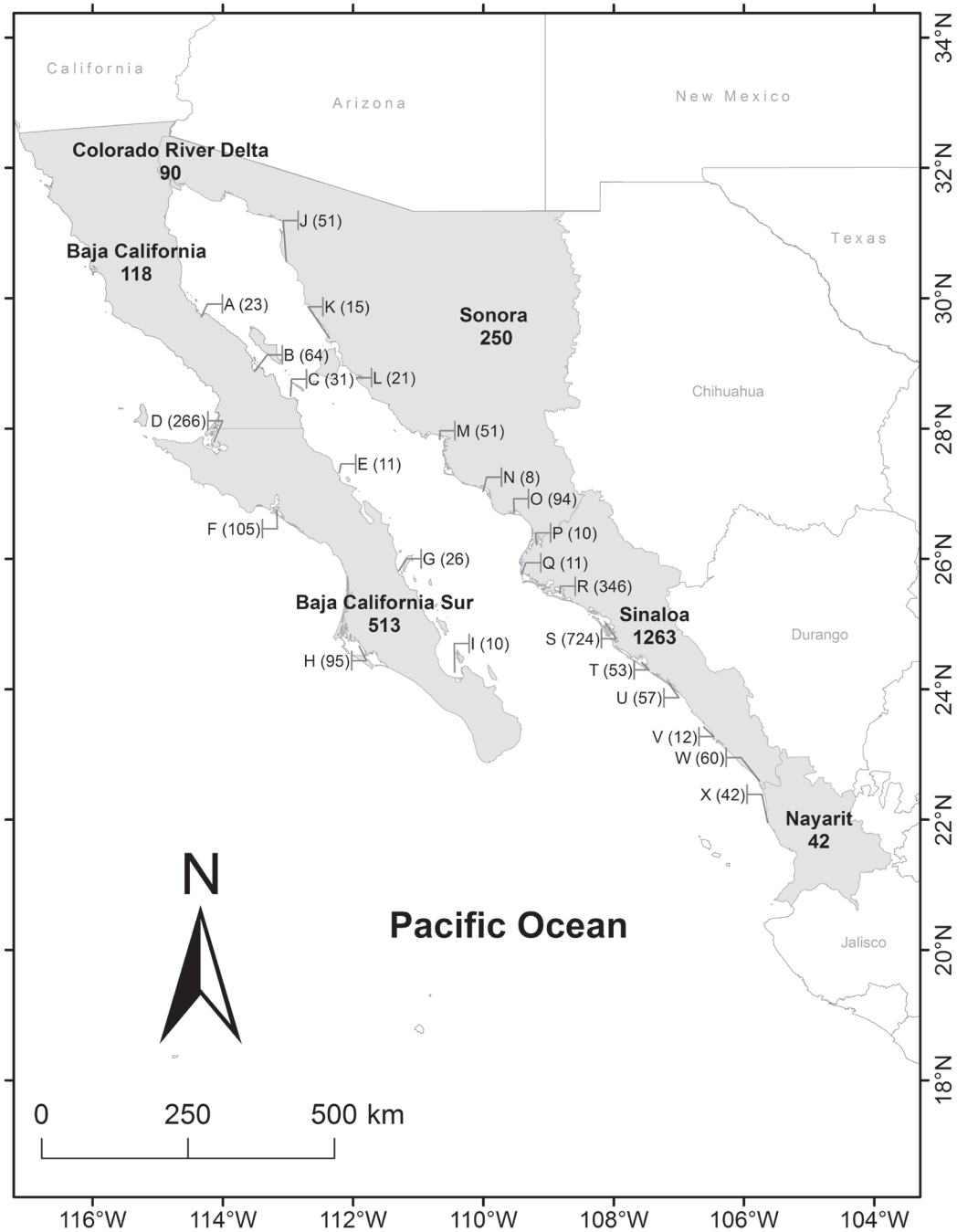


Figure 1. Map of northwest México showing the five states (shaded) of the study area and the total number of adult American Oystercatchers (*Haematopus palliatus frazari*) by state and site. Sites are: A = San Luis Gonzaga; B = Bahía de Los Angeles; C = San Lorenzo archipiélago; D = Guerrero Negro; E = Santa Rosalia; F = Laguna San Ignacio-Punta Abreojos; G = Loreto; H = Magdalena Bay; I = La Paz Bay; J = San Jorge Bay-Adair Bay; K = Los Tanques-El Sargento; L = Kino Bay; M = Guaymas-Empalme; N = Lobos-Tobarí; O = Yavaros Bay; P = Agiabampo Bay; Q = Topolobampo-Jitzamuri; R = Navachiste Bay; S = Santa María Bay; T = Ensenada Pabellones; U = Ceuta Bay; V = Cacaxtla; W = Mazatlán-Teacapan; and X = Northern Nayarit (Marismas Nacionales).

tions. At each location, we tallied all adult individuals that were observed at or near a potential nesting habitat (presumably breeders) and positioned each record of one or more individuals using a handheld Global Positioning System (GPS) device. We used standard forms to collect comparable population and location data, such as weather conditions, type of habitat, evidence of breeding (i.e., nests, chicks, or reproductive behavior), and potential threats. In coastal lagoons and on islands, we surveyed American Oystercatchers from boats with outboard motors navigating at a maximum distance of 300 m from the coast. On sandy beaches and barrier beaches, we surveyed by car and All Terrain Vehicle, at a maximum speed of 20 kmph. At a few sites with no roads or other access, such as the tip of barrier beaches, and salt and aquaculture ponds, we walked through the potential nesting habitat.

RESULTS

Between April and July 2009, we surveyed a total of 149 known and potential nesting locations in northwest Mexico that were grouped in 24 sites (Fig. 1). The American Oystercatcher occurred in 78% of all the potential locales, and varied from 60% in Nayarit to 100% in the Colorado River Delta. We counted a total of 2,286 adults (Table 1). This population suggests a reproductive population of at least 1,143 pairs for the northwest region.

The American Oystercatcher breeding range encompasses all five states of northwest Mexico, where the subspecies *H. p. frazari* is a quasi-endemic breeding subspecies; clearly, their presence as a breeding species tends to diminish or disappear both to the

south (in Marismas Nacionales, Nayarit) and to the north (Coronado Islands, Baja California) of this core area (Fig. 1). Lack of suitable nesting habitats, such as islands and barrier beaches, free of disturbance and predators might prevent American Oystercatchers breeding south of Jalisco.

Populations of Sinaloa and Baja California Sur are much higher than in other states, and account for 78% of the total population (Table 1; Fig. 1). Large wetlands that are WHSRN sites of hemispheric importance, such as Laguna Ojo de Liebre in Baja California Sur and Bahía Santa María in Sinaloa, provide extensive foraging habitat for American Oystercatchers and islands with suitable nesting habitat that is free of human disturbance, tidal flooding and terrestrial predators. This combination of habitat attributes is limited in other states and in the Colorado River Delta.

In the Baja California peninsula, the breeding habitat where most of the American Oystercatchers occurred was on islands, especially in the state of Baja California where 100% of the individuals occurred on offshore islands (82% on rocky and 18% on sand habitat), in the Gulf of California. In the state of Baja California Sur, they also used mostly islands (84%), and were distributed in different island habitats as follows: sandy (46%), rocky (29%), and shell (9%). In addition to islands, they also occurred at salt marsh and mangroves (11%), barrier beaches (2%), ponds (1.5%), and rocky

Table 1. Period of surveys and number of adult American Oystercatchers distributed by habitat at each state in northwest Mexico in 2009. BC = Baja California; BCS = Baja California Sur; CRD = Colorado River Delta; SON = Sonora; SIN = Sinaloa; NAY = Nayarit.

Habitat	BC 7 May - 31 July	BCS 22 April - 28 July	CRD 18 June - 3 July	SON 3 June - 10 July	SIN 19 May - 16 July	NAY 23 May - 15 July	Total
Island/sandy	21	238	0	16	612	0	887
Island/rocky	97	154	0	3	11	0	265
Island/shell	0	47	0	0	5	0	52
Sandy beach	0	0	6	146	184	42	378
Barrier beach	0	13	0	36	260	0	309
Rocky beach	0	8	6	10	2	0	26
Salt marsh/mangrove	0	55	78	37	166	0	336
Salt/shrimp pond	0	8	0	2	23	0	33
Total	118	523	90	250	1,263	42	2,286

beaches (1.5%). Interestingly, we did not record any American Oystercatchers on mainland sandy beaches along the peninsula (Table 1).

On the coast of mainland Mexico, American Oystercatchers did use mainland habitats during the breeding season and used more habitats than on the peninsula. On the Colorado River Delta, most of the American Oystercatchers were documented on salt marsh habitat (87%; all on Montague Island), and the remaining were observed on sandy and rocky shores (6.5% each). In Sonora, habitat use was diverse but the principal habitat was sandy beach (58%), then salt marsh and mangrove (15%), barrier beach (14%), islands with sandy habitat (6%), islands with rocky habitat (1%), rocky beaches (4%), and shrimp ponds (< 1%). In Sinaloa, the habitat most frequently used was islands with sandy habitat (48%), then barrier beaches (21%), sandy beach (15%), mangrove habitat (13%), and shrimp ponds (2%). Shell islands, islands with rocky beaches and rocky beach had less than 1% each. In Nayarit, all American Oystercatchers were observed on sandy beaches (Table 1), from Playas de Novillero to San Blas.

DISCUSSION

Our surveys provide an overview of the breeding distribution and abundance of the *H. p. frazari* subspecies of the American Oystercatcher in northwest Mexico. Although our population estimate is much larger than that previously reported, it remains relatively small. The small population size, discrete distribution, and life history traits make *H. p. frazari* a vulnerable subspecies (Clay *et al.* 2014). In previous studies, the total American Oystercatcher population for the entire Mexican Pacific population was estimated at only 350 individuals, indicating a low observation effort to assess its population. Future survey efforts need to include all habitat types where American Oystercatchers may be found. In our surveys, we failed to include more than 100 islands and islets of the Gulf of California and 20 islands off western Baja

California, as well as a few recently created dredge-spoil islands in Sonora, Baja California Sur, Sinaloa and Nayarit that may provide additional nesting habitat for American Oystercatchers in the region.

Our population estimate of 2,286 individuals is conservative as we probably underestimated the actual number of American Oystercatchers in northwest Mexico. Our survey methodology did not consider tide conditions, but future surveys need to take this into account. Hostetter *et al.* (2015) found that detection probability during high tide was higher than during low, rising, or falling tides. We also assumed no differences in detection probability among ground survey methods (e.g., by boat, car, or walking). Accordingly, we recorded and added the total of American Oystercatcher detections despite potential differences among survey methods (e.g., Brown *et al.* 2005).

South of Nayarit, there is only one breeding record of American Oystercatcher in Jalisco (Laguna Agua Verde, in 2000) (Hernández-Vázquez *et al.* 2010). We are not aware of any evidence of nesting sites south of Jalisco, which is the contiguous state south of Nayarit (Fig. 1). In 2007, we documented a total of 20 adults between Jalisco and Chiapas, most were found in Jalisco (17 adults); plus one in Colima and two in Michoacán. In March 2010, we observed 17 adults in Oaxaca, but found no evidence of breeding and, because of the time of the year, we assumed that they were nonbreeding individuals. Also, based on our 2009 surveys and additional records from other locales surveyed in 2007 and 2008, we documented 14 mixed American/Black Oystercatcher pairs on the west coast and islands of the peninsula from Coronado Islands, Baja California (four pairs) to Isla Santa Margarita, Baja California Sur (10 pairs), but only four definitive hybrid individuals (Palacios *et al.* 2009).

Habitat use patterns of American Oystercatchers in northwest Mexico seem to be related to preference for islands close to extensive foraging grounds, suggesting that habitats free of predators and human disturbance might be a limiting factor to American Oystercatcher breeding populations in

northwest Mexico. Although sandy beaches are readily available, American Oystercatchers do not frequently use them presumably because of disturbance by humans and free-ranging livestock including cattle (*Bos taurus*) and pigs (*Sus scrofa*), and dogs (*Canis lupus*) on sandy beaches. Moreover, tourist and urban development of sandy beaches and other coastal habitats (Berlanga-Robles and Ruiz-Luna 2006; Molina 2008) may affect potential breeding habitat at a regional scale.

Information provided in this study could be valuable for setting goals for the conservation of the American Oystercatcher. We identified important American Oystercatcher sites that could be nominated as regional WHSRN sites (1% of the biogeographic population) including Bahía de Los Angeles Biosphere Reserve (64 adults) in Baja California and Yavaros-Moroncarit (94 adults) in Sonora; in addition, Bahía Navachiste (346 adults) could be nominated as an international WHSRN (10% of the biogeographic population) site in Sinaloa (Fig. 1). Habitat protection for shorebird conservation is a high priority in this region and should include ranking sites by importance to nesting American Oystercatchers.

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