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Breeding Season Abundance and Distribution of American Oystercatchers in South Carolina

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Abstract.—Three statewide surveys in South Carolina for American Oystercatchers, *Haematopus palliatus*, were conducted during the breeding season from 2001-2003. A mean of 1,105 oystercatchers were recorded each year. In 2002, 407 breeding pairs were documented and in 2003, 397 pairs. There were 378 nonbreeding oystercatchers in 2002 and 383 in 2003. The Cape Romain Region supported a majority of South Carolina's breeding pairs and nonbreeding flocks. Oystercatchers nested, on average, closer to each other on estuarine islands, (specifically made of shell) and farthest apart on edge shell mounds. Although historically oystercatchers may have nested primarily on front beaches, this study documented only 28% of the breeding pairs on barrier island beaches, 27% on estuarine islands and 45% on edge shell mounds. Twenty-four percent of all pairs in South Carolina were on edge shell mounds adjacent to the Atlantic Intracoastal Waterway (AIWW). Nesting on shell mounds may become increasingly important as beaches become more disturbed by humans and dogs. Received 12 June 2007, accepted 20 November 2007.

Key words.—American Oystercatcher, *Haematopus palliatus*, South Carolina, shorebird surveys, nesting, nearest neighbor.

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In the 1800s American Oystercatchers (*Haematopus palliatus*) bred along the entire Atlantic coast perhaps as far north as Labrador and certainly as far north as Maine (Audubon 1835; Bent 1929). By the early 1900s oystercatchers disappeared from the northern part of their range and Virginia was listed as the most northern nesting location on the Atlantic coast (AOU 1910). Even south of Virginia, where they once were considered abundant, oystercatcher nesting in the early 1900s was rare (Bent 1929). Their decline was mostly attributed to gunners that were hunting spring long distance migrating shorebirds on coastal beaches. Oystercatchers were an easy target for the hunters and their nests were destroyed (Bailey 1913). After the passage of the Migratory Treaty Act in 1918, breeding abundance and distribution of oystercatchers on the Atlantic coast increased and presently they breed as far north as Nova Scotia (Nol and Humphrey 1994).

Davis *et al.* (2001) estimated 1,624 breeding pairs for the Atlantic coast from Florida north, but recent surveys in Virginia and Maryland documenting 588 and 108 respectively, suggest this Atlantic coast estimate is

low (Wilke *et al.* 2005; Traut *et al.* 2006). Additionally, a comprehensive survey of the Atlantic and Gulf coasts of the United States during the winter of 2002 and 2003 recording approximately 10,000 oystercatchers, suggest breeding season estimates for parts of this region are inadequate (Davis *et al.* 2001; Brown *et al.* 2005). Although breeding estimates are lacking for some states, there is evidence breeding numbers are declining in states south of Virginia (Davis *et al.* 2001). Oystercatcher numbers on the barrier islands of Virginia declined from 1984 to 2003 by 47% (Wilke *et al.* 2005). Because of degradation and rapid development of the species' traditional beach nesting habitat, the United States Shorebird Conservation Plan identified the eastern race of the American Oystercatcher as an extremely high priority (Brown *et al.* 2001). The Southeast Shorebird Conservation Plan also lists the American Oystercatcher as a species of highest regional priority (Hunter 2000).

Breeding surveys are encouraged by the Southeast Shorebird Conservation Plan not only to gather information on population trends but to identify and protect nesting hab-

itat (Hunter 2000). Prior to this study, the only breeding pair estimate of South Carolina was made from a count of nests with eggs conducted in 1986 (112 nests were found) (Davis *et al.* 2001). Because depredation of oystercatcher nests is high and nests can be difficult to locate, this underestimated the number of breeding pairs in South Carolina. Historically, South Carolina supported large numbers of oystercatchers compared to other Atlantic states (Sprunt and Chamberlain 1949). Presently, South Carolina supports more oystercatchers in the winter than any other state, one third of the wintering numbers recorded along the Gulf and Atlantic coasts (Sanders *et al.* 2004; Brown *et al.* 2005). This study is the first comprehensive survey in South Carolina for oystercatchers during the breeding season. The primary objectives of this project were to document number, location and habitat type of breeding and nonbreeding oystercatchers during the spring. Additionally, egg size, clutch size and breeding chronology are reported for selected sites.

STUDY SITE AND METHODS

Three statewide surveys for oystercatchers were conducted 21 April-9 May 2001, 27 April-24 May 2002 and 29 April-28 May 2003. Coastal habitat was examined prior to 2001 during the spring for oystercatcher presence. Surveys covered three main areas along coastal South Carolina: 1) barrier island beaches, 2) sand or shell estuarine islands and 3) edge shell mounds. Oystercatchers are not present in coastal habitat with widespread human development, such as beaches connected to the mainland in South Carolina, thus these areas were not surveyed. Barrier islands in South Carolina generally have sandy beaches parallel and fronting the ocean, dunes and vegetated areas behind the front beach, and are separated from the mainland by broad (>5 km) salt marshes. They were surveyed by foot, on all terrain vehicles or by boat. Approximately 1,000 washed shell mounds were surveyed by boat and by foot. They accumulate from wave action created by wind or boat wakes in estuarine habitats with copious submerged shells and take the form of narrow ridges along creeks, rivers, and bays (edge shell mounds) and occasionally form small islands in large bays (shell estuarine islands). Shell mounds are made of primarily oyster shells (*Crassostrea virginica*) with clam (*Mercenaria*) and whelk (*Busycon*) shells also present. Mean dimensions of shell mounds in South Carolina are 107 m × 3 m, although lengths range from 4 to 999 m long (Anderson *et al.* 1979). Numerous edge shell mounds examined during these surveys are along the AIWW. The AIWW is a federally maintained navigation channel that extends from Norfolk, Virginia to Miami, Florida and is part of a larger waterway extending north to Boston, Massachusetts (Parkman 1983).

The coast was divided into 25 distinct areas for descriptive purposes, consisting of different islands, creeks or waterways. A portion of the surveys were conducted in the Cape Romain Region, the area of the South Carolina coast from the Cape Romain National Wildlife Refuge south to the Isle of Palms (see Dodd and Spinks 2001 for description of region).

Surveys were conducted within two hours of high tide because potential nest sites were more accessible by boat at higher water levels and oystercatchers were not likely to be dispersed on foraging areas (Prater 1981). The number and location of oystercatchers were recorded. Locations were documented with a Global Positioning System unit and mapped in ArcMap (ESRI 2002). In 2002, the distance from each pair to the nearest pair was determined using ArcView (ESRI 1999) and the Nearest Features v. 3.8a extension (Jenness 2004).

Adult oystercatchers have a bright orange bill and immature oystercatchers have a dark orange/brown bill (Nol and Humphrey 1994). The bill of the European Oystercatcher (*Haematopus ostralegus*) is orange and brown the first and second year and orange at age three and older (Prater *et al.* 1977). American Oystercatcher bill coloration is assumed to be similar to that of the European Oystercatcher. In 2002 and 2003, flocks of one to three birds were distinguished as either breeding pairs or as nonbreeding birds based on bill color. For example, a single bird with adult bill coloration roosting on a potential nest site was counted as a breeding pair. Its mate was assumed to be absent or out of view. All flocks of more than three birds were considered nonbreeding flocks. Because bill color was not examined in 2001, flocks of one to three birds were not distinguished as breeding pairs or nonbreeding flocks and only the number of oystercatchers observed is reported. In 2002 and 2003, the percentage of immature oystercatchers was estimated in each nonbreeding flock. Because not all bills were clearly visible, estimates of immature birds were from a subset of the total oystercatchers counted.

The first clutch of the season is typically three eggs and eggs are laid in a shallow depression (called a scrape) lined with small shells or wrack (Nol *et al.* 1984; Nol and Humphrey 1994). In 2001, brief nest searches were conducted when pairs were located. Nest scrapes were recorded. If a scrape had eggs, clutch size was also recorded. Length and width of all eggs from 50 clutches found on the AIWW (in Cape Romain Region) and Crab Bank and Castle Pinckney (in Charleston Harbor) were measured with calipers to the nearest 0.5 mm. Because the variation in egg size between clutches is larger than the variation between individual eggs in a single clutch (Nol *et al.* 1984), mean egg width and length for each clutch were calculated and then these widths and lengths were used to calculate mean dimensions for all eggs measured.

In 2003, a search for oystercatcher nests occurred on the AIWW once a week in the Cape Romain Region to determine nesting chronology for South Carolina oystercatchers.

RESULTS

A total of 961, 1,184 and 1,171 (mean = 1,105) American Oystercatchers were counted in 2001, 2002 and 2003, respectively (Table 1). In 2002, 407 breeding pairs were

Table 1. Number of American Oystercatchers during the breeding season at 25 sites in South Carolina.

Location	2001 Total	2002 Total	2002 Pairs	2003 Total	2003 Pairs
AIWW McClellanville-Isle of Palms ^a	204	301	51	286	61
AIWW Isle Palms-Charleston	22	4	2	17	9
Beaufort River	28	43	19	31	16
Bird Key	10	7	4	7	5
Broad River	47	40	16	33	16
Bulls Bay NE ^a	*	2	1	2	1
Bulls Bay SW ^a	72	28	14	18	9
Cape and Lighthouse Islands ^a	57	62	25	75	38
Cape Romain Harbor ^a	34	29	14	34	17
Charleston Harbor	54	64	32	92	35
Deveaux Bank	21	22	11	37	20
Edisto Rivers	12	51	7	68	10
Five Fathom Creek ^a	8	4	2	17	3
Hilton Head Island	50	52	23	43	22
Little River Inlet	2	*	*	*	*
Marsh Island ^a	31	62	18	76	18
Murrells Inlet	23	48	21	17	8
North Inlet	22	41	14	63	14
North Santee Bar	*	4	2	*	*
Raccoon Key ^a	154	190	73	95	51
Sand Island	*	12	6	*	*
St. Helena Sound	15	26	13	25	13
Stono River	7	15	1	4	2
Trenchards Inlet	32	13	6	51	0
White Banks ^a	56	64	32	80	29
Total	961	1,184	407	1,171	397

^aSites located in Cape Romain Region.

*Sites not surveyed but oystercatchers may be present.

counted (Fig. 1) and in 2003, 397 pairs. There were 378 nonbreeding oystercatchers in 2002 and 383 in 2003. The Cape Romain Region supported 230 (57%) in 2002 and 227 (57%) in 2003 breeding pairs and had 265 (70%) in 2002 and 242 (63%) in 2003 nonbreeding birds. Bull Island (in Cape Romain Region), South Island, Botany Plantation and Dewees Island were not surveyed but anecdotal reports suggest one to two pairs nested on each island during this study.

In 2002, 98 (24%) of all pairs in the State were on edge shell mounds adjacent to the AIWW, approximately half of all pairs on edge shell mounds (Table 2). Mean nearest neighbor distance to an individual pair for the entire state was 334 (2-3,792) m \pm 27 SE, N = 396. On barrier islands, mean distance was 200 (5-2,042) m \pm 29 SE, N = 110, estuarine islands 65 (2-769) m \pm 10 SE, N = 107 and edge shell mounds 577 (2-3,792) m \pm 51 SE, N = 179. On estuarine islands composed

of shell, distance was 36 (4-148) m \pm 5 SE, N = 45.

Immature-to-adult ratios were estimated in all nonbreeding flocks by looking at bill color of 116 (31%) and 218 (57%) of the birds in nonbreeding flocks in 2002 and 2003, respectively. In 2002, 72% of birds examined in nonbreeding flocks had immature bill coloration and in 2003, 56%. Flock size for nonbreeding birds ranged from one to 61 with mean flock size (12 \pm 3 SE, N = 32) in 2002 and 1-100 (15 \pm 5 SE, N = 25) in 2003.

In 2001, 66 pairs had nest scrapes but no eggs and 181 egg nests were found. Mean clutch size was 2.5 (1-4) \pm 0.1 SE representing complete, incomplete and partially depredated clutches. Two nests had four eggs. These nests were associated with breeding "pairs" consisting of three birds in an area of dense nesting. In these nests, two eggs were of one distinct color, size and pattern and the other two eggs had different characteris-

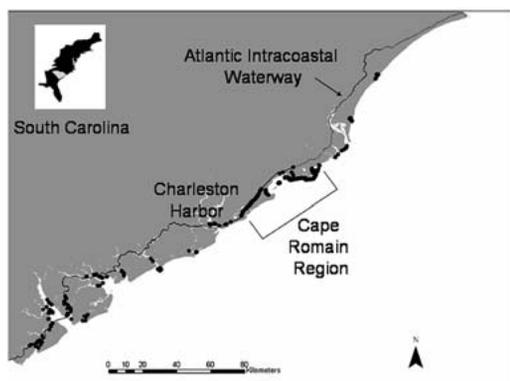


Figure 1. Distribution of American Oystercatchers breeding pairs in spring 2002 on the coast of South Carolina. Over half the pairs occurred in the Cape Romain Region.

tics suggesting the adults were two females and one male. Communal nests may be advantageous for defending high quality territories because three birds defend instead of two (Lauro *et al.* 1992). One hundred fourteen eggs were measured from 50 nests with clutch sizes ranging from 1 to 3. Mean widths were 39.2 (32.0-42.0) mm \pm 0.2 SE, N = 50 and length 56.2 (52.6-60.5) mm \pm 0.3 SE, N = 50. In 2003, the first nest was found on 31 March and the latest date eggs were observed was 16 July.

DISCUSSION

Tomkins' (1947) observations and recent banding studies (South Carolina Department of Natural Resources, unpubl. data) in South Carolina indicate that birds that nest in South Carolina do not migrate and are permanent residents. An average of 3,536 oystercatchers winter in South Carolina

Table 2. Habitat type of American Oystercatcher pairs during the 2002 breeding season in South Carolina.

Habitat	Number of pairs	%
Barrier island	114	28
Estuarine shell island	45	11
Estuarine sand island	65	16
Edge shell mound	183	45
Total	407	100

(Sanders *et al.* 2004) suggesting two-thirds of wintering oystercatchers migrate out of South Carolina during the breeding season. Because oysters are the primary prey of oystercatchers in South Carolina (Tomkins 1947; South Carolina Department of Natural Resources, unpubl. data) and breeding season abundance of oystercatchers is less than wintering abundance, food may not be a limiting factor for nesting.

Although comprehensive breeding estimates are not available for all states, South Carolina's breeding numbers are probably second only to Virginia (Davis *et al.* 2001; Wilke *et al.* 2005). Surveys of Florida's Atlantic and Gulf coast in 2001 report almost as many (391 pairs) but only 11% of those on Florida's Atlantic coast (Douglass and Clayton 2004). Other states on the Atlantic estimate less than 300 breeding pairs (Davis *et al.* 2001).

The historical distribution and abundance of oystercatchers in South Carolina is unclear. Sprunt and Chamberlain (1949) reported oystercatchers in South Carolina nest primarily on front beaches, not always near inlets. Yet Erichsen (1921) found a nest on a wall of shell on Raccoon Key and noted wherever this type of habitat existed one could find a nest. 1944 Cape Romain National Wildlife Refuge annual report lists oystercatchers nesting on shell and beaches. Oystercatcher nesting on shell mounds may not have been described by all early naturalists because it requires surveying 100s of km of marsh edge from a boat. Also, shell estuarine islands are often surrounded by live oyster reefs and are difficult to access except at high tide. Nesting on shell mounds may become increasingly important as beaches become more disturbed by humans and dogs. Annual population growth rates in coastal counties in South Carolina range from 1%-3% and urban land use change is occurring at a rate six times that of population growth (Alan and Lu 2003; United States Census Bureau 2007). In the early 1900s oystercatchers nested on barrier islands that are now developed and have little or no nesting pairs. Oystercatchers were common nesting in the early 1900s on Sullivan's, Isle of Palms, Dewees, Capers and Bulls Islands (barrier islands north of

Charleston, South Carolina) (Wayne 1910). The Charleston museum houses oystercatcher eggs collected from nests on the Isle of Palms on 20 April 1941, further supporting their presence on these barrier islands (Will Post, museum curator, pers. comm.). Isle of Palms and Sullivan's Island are now densely populated and support no oystercatcher nesting. Dewees, Capers and Bulls Islands together now support one or two pairs.

Oystercatchers nested, on average, closer to each other on estuarine islands, (specifically made of shell) and farthest apart on edge shell mounds. On the four shell estuarine islands in South Carolina, oystercatcher nesting is dense and the species is semicolonial. Shell is the most important substrate for nesting in South Carolina. Likewise in Virginia, 52% nested on shell mounds and in Florida, 44% nesting on natural sites were on shell mounds (Douglass and Clayton 2004; Wilke *et al.* 2005).

Almost a quarter of the oystercatchers pairs were found on shell adjacent to the AIWW. The 2,000 km AIWW is maintained by the United States Army Corps of Engineers to provide a safe inshore course for commercial and recreational boats. Most of the construction of AIWW in South Carolina was conducted from 1881 to the late 1930s (Parkman 1983). The State owns the shell mounds and South Carolina Department of Natural Resources permits removal of shell for commercial clam and oyster mariculture. Very few fledglings are produced by breeding pairs that nest on the AIWW (South Carolina Department of Natural Resources unpubl. data). The oystercatcher nesting season coincides with the spring migration of large yachts moving north on the AIWW creating large boat wakes that, at high tide, can wash over the shell mounds and sweep eggs away. Because the AIWW is a man-made channel often very near the mainland, depredation by mammals and avian predators may also result in low nest success. Further research is needed to investigate reproductive success in these areas and to provide management suggestions to improve nesting success on this heavily used habitat. This research will also benefit the numerous pairs nesting on

edge shell mounds along the minor navigational channels in South Carolina.

The Cape Romain Region not only has over half South Carolina's wintering oystercatchers (Sanders *et al.* 2004) but also supports a majority of South Carolina's breeding pairs. Historically, the distribution appears to have been the same. Tomkins (1947) reported about 300 pairs in Cape Romain, although the exact boundaries of this location are not defined, and less than 35 pairs from Charleston south to Georgia. The Cape Romain Region also supports a majority of nonbreeding birds in South Carolina in the spring. On the AIWW in the Cape Romain Region, nonbreeding flocks were seen throughout the summer months (Sanders *et al.* 2004). Many European Oystercatchers do not return to their breeding grounds until their fourth summer (Hulscher *et al.* 1996). In addition to being an important wintering site for oystercatchers that breed north of South Carolina, the Cape Romain Region may serve as an important site throughout the year for immature birds from other states. The only other state to report numbers of nonbreeding oystercatchers during the spring is Virginia (161 birds), although nonbreeding flocks are probably present in other areas (Wilke *et al.* 2005). Research focusing on understanding why oystercatchers were historically and are presently numerous year round in the Cape Romain Region may guide conservation efforts in other parts of the species' range.

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