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HEALTH ASSESSMENT OF AMERICAN OYSTERCATCHERS (*HAEMATOPUS PALLIATUS PALLIATUS*) IN GEORGIA AND SOUTH CAROLINA

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ABSTRACT: The American Oystercatcher (*Haematopus palliatus palliatus*) is the only species of oystercatcher native to the Atlantic coast of North America and is restricted in distribution to intertidal shellfish beds in coastal areas. Currently, the American Oystercatcher population in South Carolina and Georgia is threatened by widespread habitat loss, resulting in low reproductive success and small population size. Oystercatchers could be an important indicator of ecosystem health because they depend on quality coastal breeding habitat and prey on bivalves, which can accumulate toxins and pathogens from the local environment. Data were collected from American Oystercatchers ($n=171$) captured at five sites in South Carolina and Georgia between 2001 and 2006. Iridial depigmentation was frequently noted during physical examination and was more prevalent in female birds. Female birds were larger than males on average, but ranges for weight and morphometric measurements had considerable overlap. Mean values were calculated for hematology, plasma biochemistry, and hormone levels, and prevalence of exposure to select pathogens was determined. Mercury was the only trace metal detected in blood samples. These data provide baseline health information needed for longitudinal monitoring and conservation efforts for American Oystercatchers. In addition, this study illustrates the potential use of this species as an indicator for the health of the southeastern US coastal nearshore ecosystem.

Key words: American Oystercatcher, biochemistry, ecosystem health, hematology, indicator.

INTRODUCTION

The American Oystercatcher (*Haematopus palliatus palliatus*) is the only species of oystercatcher native to the Atlantic coast of North America (Nol and Humphrey, 1994). The American Oystercatcher population in South Carolina and Georgia is threatened by widespread habitat loss, resulting in low reproductive success. Heavy recreational use of sensitive coastal habitat by local human populations along the southeastern coast of the United States has reduced available breeding habitat required by the species for successful reproduction (Brown et al., 2005). Because the population is small and faces continued threats to essential habitat, the American Oystercatcher has been listed as a species of high concern by the US Shorebird Conservation Plan (Brown et al., 2001).

With a preferred diet of bivalves, the species' distribution is restricted to inter-

tidal shellfish beds in coastal areas (Nol and Humphrey, 1994). Bivalves are filter feeders that can accumulate toxins and pathogens from the local environment in their tissues (O'Connor, 2002). Because bivalves are a common food source for oystercatchers and humans alike, pathogens and contaminants detected in the birds could have public health implications. The objective of our study was to conduct a health assessment of a native shorebird population through the collection of health-related data, the results of which can be utilized for both species conservation efforts and monitoring of ecosystem health. Specifically, in this investigation we report values for hematology parameters, plasma biochemistry, and reproductive hormone levels, and evaluate heavy metal and environmental contaminant levels and exposure to infectious agents for the American Oystercatcher along the southeastern coast of the United States.

MATERIALS AND METHODS

Data were collected from American Oystercatchers ($n=171$) captured at five sites in South Carolina and Georgia, USA between 2001 and 2006. In South Carolina, 81 birds were captured by the South Carolina Department of Natural Resources (SCDNR) in the Cape Romain Region, an area that winters the largest concentration of American Oystercatchers (almost 2,000) on the Atlantic coast (32°53′27″N, 79°41′46″W; Sanders et al., 2004). In Georgia, 90 birds were captured by the Georgia Department of Natural Resources (GDNR) at Little St. Simon's Island ($n=26$; 31°16′25″N, 81°38′68″), Cumberland Island ($n=9$; 30°97′40″N, 81°41′68″W), Sapelo Island ($n=11$; 31°39′20″N, 81°28′52″W), and Wolfe Island ($n=44$; 31°19′38″N, 81°17′45″W). Decoy-noose traps and box traps were used to capture single birds just prior to nesting and during the breeding season (Mills and Ryder, 1979; McGowan and Simons, 2005). Cannon-netting was used to capture birds onshore from September through February (Crozier and Gawlik, 2003). Trapping and sampling procedures were in accordance with SCDNR and GDNR institutional animal care and use committee standards.

A physical examination using manual restraint was performed on each bird immediately upon removal from the decoy noose trap or box trap. Birds captured by cannon-net were placed temporarily in cardboard carriers and processed within 4 hr of capture, either at the capture site or a staging area. Body condition score (BCS) was based on palpation of muscle mass at the keel using the following scale: 1, emaciated; 2, thin; 3, normal; 4, overweight, and 5, obese. Morphometric measurements (wing length, flat wing length, tarsus length, and bill length) and weight were recorded according to standard methods (Hockey, 1981). Wingchord and flat wing length (or maximum wing chord) were recorded for birds captured in South Carolina and Georgia, respectively. Birds were categorized as adults if bill color was bright yellow, orange, or mostly orange, and immature if the bill had varying degrees of orange, brown, and black (Prater et al., 1977). Presence and severity of iridial depigmentation was recorded (none, very mild, mild, moderate, or severe), as well as the presence or absence of ectoparasite infestation. Identification leg bands were placed on each bird in accordance with US Geological Survey bird banding laboratory protocols for permanent identification.

A maximum of 3 ml of blood was collected by venipuncture of the right jugular vein using a disposable 0.7×25 mm needle and sodium heparinized 3 cc syringe. Samples were immediately aliquoted into 1.8 ml cryovials (Nunc A/S™, Roskilde, Denmark). Blood collection tubes were stored in a cooler until transfer into a −70 C freezer. ZooMark™ collection cards or filter paper were used to collect whole blood for genetic determination of sex using polymerase chain reaction (PCR) amplification of the chromo-helicase-DNA binding protein (CHD) gene on avian sex chromosomes Z and W (Zoogen Inc., Davis, California, USA).

Hematologic and biochemical parameters were chosen as indicators of bird health because they represent physiologic processes and organ function and are influenced by environmental conditions and nutritional and disease status (Wolkers et al., 1994; Mazet et al., 2000; Hanni et al., 2003). Four blood smears were made from heparinized blood within 10 min of collection. Smears were then dried, fixed in methanol, and stained with Wright–Giemsa stain (JorVet, Dip-Quick, Jorgensen Laboratories, Loveland, California, USA). Blood smears were examined by light microscopy at the White Oak Conservation Center (Yulee, Florida, USA) by one veterinary technician (M. Oliva) for calculation of a differential white-blood-cell count (WBC)

TABLE 1. Body weight and morphometric measurements for American Oystercatchers captured between January 2001 and September 2006 in Georgia and South Carolina, USA.

Parameter	Adult male				Adult female				P
	n	Mean±SD	Median	(Range)	n	Mean±SD	Median	(Range)	
Weight (kg)	52	581.2±53.20	576	(425–702)	34	630.8±45.62	620.5	(540–739)	<0.001
Bill length (mm)	39	80.4±5.00	80.2	(70.0–94.3)	32	93.4±6.35	94.1	(76.0–103.4)	<0.001
Wingchord[b] (mm)	19	248.3±9.02	250	(222–260)	14	252.3±8.77	253.5	(229–262)	0.216
Flat wing[b] (mm)	36	257.6±7.34	256	(241–273)	21	265.6±7.27	265	(256–282)	<0.001
Tarsal length (mm)	40	57.7±4.68	57.8	(47.7–70.0)	32	61.0±3.94	61.6	(51.0–68.4)	0.002

[a] Assumptions of normality were not met for these parameters.

[b] Method of wing measurement differed by state: wingchord was measured on birds captured in South Carolina and flat wing or maximum chord was measured in birds captured in Georgia.

based on 100 cells counted at 1000× magnification. The Eosinophil Unopette™ (Becton Dickinson, Franklin Lakes, New Jersey, USA) hemocytometer technique was used by the same individual (T. Norton) to obtain total white-blood-cell counts within 12 hr of collection (Cray and Zaias, 2004). A small amount of heparinized whole blood was transferred to a microhematocrit tube and centrifuged (HemataSTAT.II, Separation Technology, Inc., Altamonte Springs, Florida, USA) to measure packed cell volume (PCV).

Biochemical profiles were performed on plasma samples using standard dry slide determinations with a Kodak 700XR™ chemical analyzer by the Division of Comparative Pathology, University of Miami (Miami, Florida, USA). The following blood values were measured: glucose, sodium, potassium, carbon dioxide, creatinine, total protein, phosphorus, calcium, uric acid, creatine phosphokinase (CPK), alanine aminotransferase (ALT), aspartate aminotransferase (AST), lactate dehydrogenase (LDH), lipase, amylase, gamma-glutamyl transferase (GGT), cholesterol, and triglycerides. Protein fractions were evaluated by electrophoresis and plasma bile acid was measured by radioimmunoassay (RIA; University of Miami, Miami, Florida, USA; Cray and Tatum, 1998; Cray and Andreopoulos, 2003). *Chlamydophila psittaci* antibody titers were determined by indirect immunofluorescence and *Aspergillus* IgG-antibody titers and antigen titers were determined by enzyme-linked immunosorbent assay (ELISA; University of Miami, Miami, Florida, USA; Cray et al., 2009). Plasma samples were tested for West Nile Virus (WNV) antibodies (Allison et al., 2004).

For reproductive hormone analysis, 50 µl of plasma were extracted twice with 5 ml of diethyl ether before RIA analysis. Samples were analyzed for 17ß-estradiol and testosterone. Standard curves were generated with known concentrations of radioinert 17ß-estradiol (ICN Biomedicals, Costa Mesa, California, USA) or testosterone (Sigma Chemical, St. Louis, Missouri, USA; 1, 5, 10, 25, 50, 100, 250, 500, and 1,000 pg per ml). The minimum concentration detectable for both hormones was 7 pg/ml. Methods followed those described in Sepúlveda et al. (2003).

Heavy metal and pesticide screens were performed at Savannah Toxicology Laboratory (STL; Savannah, Georgia, USA). Whole blood samples were analyzed for chromium, copper, lead, zinc, tin, arsenic, strontium, and vanadium using inductively coupled plasma optical emission spectroscopy (ICP-OES). Mercury was measured by cold vapor atomic absorption. Limits of quantification (LOQs) for heavy metals were: chromium 1.0 ppm, mercury 0.04 ppm, copper 2.0 ppm, lead 1.2 ppm, zinc 0.020 ppm, tin 5.0 ppm, arsenic 1.0 ppm, strontium 1.0 ppm, and vanadium 1.0 ppm. Organochlorines (OCs) and polychlorinated biphenyls (PCBs) were quantified in whole blood samples with gas-liquid chromatograph electron capture detection. The pesticide screen included arochlor congeners 1016, 1221, 1232, 1242, 1248, 1254, and 1260 (LOQ 1,800 ppm); α-, β-, δ-, and γ-benzene hexachloride, heptachlor, aldrin, heptachlor epoxide, endosulfan I (LOQ 93 ppm); endosulfan II, endosulfan sulfate, dieldrin, endrin, dichlorodiphenyldichloroethane (DDE), 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane (DDD), dichlorodiphenyltrichloroethane (DDT), endrin ketone (LOQ 180 ppm); α-chlordane, γ-chlordane (LOQ 93 ppm); methoxychlor (LOQ 930 ppm); and toxaphene (LOQ 9300 ppm).

Cloacal samples were collected with cotton-tip swabs and placed in viral transport media (brain-heart infusion broth with antibiotics,

TABLE 1. Extended.

Immature male				Immature female				
n	Mean±SD	Median	(Range)	*n*	Mean±SD	Median	(Range)	*P*
13	541.7±46.54	537	(430–594)	12	581.2±35.05	582	(535–635)	0.026
4	80.8±5.15[a]	80.1	(75.7–87.2)	5	91.1±4.59[a]	89.7	(86.6–97.0)	0.028
1		242		1		248		
4	250.0±7.00[a]	249.5	(242–259)	5	260.8±3.42[a]	261.0	(256–264)	0.036
4	57.6±8.22[a]	57.8	(47.4–67.4)	5	60.9±3.35[a]	62.4	(56.9–63.7)	0.623

Becton Dickinson, Sparks, Maryland, USA) for avian influenza virus isolation according to established methods (Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, Georgia, USA; Hanson et al., 2008).

For blood parameters and morphometric measurements, normality was assessed using the Shapiro Wilks test (Kleinbaum et al., 1998). Mean and standard deviation were determined for parameters where normality was accepted and medians and ranges were reported for parameters when normality was rejected. Factorial analysis of variance (ANOVA) was used to evaluate significant differences in continuous health parameters by capture location, age, and sex and to evaluate interactions of these effects ($P \leq 0.05$, Kutner et al., 2005). For blood parameters, significant differences between comparison groups were adjusted using a sequential Bonferroni adjustment with an overall significance level of $\alpha = 0.05$ for $k = 34$ blood parameters (Rice, 1989). When normality was rejected, comparisons were made using Kruskal–Wallis one-way ANOVA or the Mann–Whitney *U* test (Daniel, 2005). Differences by age, sex, and capture state for categorically distributed parameters were determined using the chi-square test of independence or the Fisher exact test when expected cell frequency was less than five (Daniel, 2005). Data analyses were performed using the statistical software package STATA 10 (StataCorp, College Station, Texas, USA).

RESULTS

Of the 171 oystercatchers captured, 85 males and 69 females were identified by genetic sexing. Sex was not determined for the remaining 17 birds. A larger proportion of females were captured in South Carolina compared to Georgia ($\chi^2 = 4.66$, $P = 0.031$). A majority of the birds were adult (101/130). Age ratios varied significantly by capture location, with a larger proportion of immature birds captured in Georgia ($\chi^2 = 11.83$, $P = 0.001$).

All birds evaluated for body condition ($n = 96$) had thin to normal body condition scores (BCS 2–3). Body condition did not vary significantly by age, sex, or location. Lice, identified as *Saemundssonia haematopi*, were present on all birds examined for ectoparasites ($n = 101$). The most common finding noted on physical examination was ventral iridial depigmentation, found on 103 of the 120 birds evaluated; 11/120 were affected unilaterally and 92/120 were affected bilaterally. The presence of iridial depigmentation was more common in female birds ($\chi^2 = 11.10$, $P = 0.001$), but was not associated with age ($\chi^2 = 1.10$, $P = 0.30$) or capture location ($\chi^2 = 0.43$, $P = 0.52$). Iridial depigmentation was not associated with markers indicative of disease, including low body weight ($P = 0.96$), total protein ($P = 0.06$), white blood cell count ($P = 0.68$), α_1 globulins ($P = 0.74$), α_2 globulins ($P = 0.34$), β globulins ($P = 0.09$), or γ globulins ($P = 0.75$). Male birds were more likely to have no ($\chi^2 = 11.10$, $P = 0.001$) or very mild ($\chi^2 = 6.83$, $P = 0.009$) iridial depigmentation; females were more likely to have moderate ($\chi^2 = 12.39$, $P < 0.001$) or severe ($\chi^2 = 5.64$, $P = 0.018$) depigmentation.

Means, standard deviations (SD), medians, and ranges for body weight and morphometric measurements are presented in Table 1. Adult female birds were

TABLE 2. Hematology and plasma chemistry values for American Oystercatchers captured between January 2001 and September 2006 in Georgia and South Carolina, USA.

Parameter	Mean±SD	Median	Range	*n*
Packed cell volume (%)	45.2±3.63	45	38–55	145
Total solids (g/dl)	3.9±0.60	3.9	2.5–5.5	142
White blood cell count ($\times 10^3$/ml)	8.7±4.25	8.1	2.3–19.7	62
Heterophils (%)	46.1±14.87	46	16–77	115
Lymphocytes (%)	36.0±13.65	35	10–73	115
Monocytes (%)[a]	1.6±1.53	1	0–8	115
Eosinophils (%)	13.9±8.52	12	1–37	115
Basophils (%)[a]	2.5±1.91	2	0–8	115
Glucose (mg/dl)	337.2±50.05	329	247–534	94
Sodium (mmol/l)	150.7±17.34	149	142–175	85
Potassium (mmol/l)	3.20±0.742	3	2.0–6.2	84
Carbon dioxide (mmol/l)	23.8±3.85	24	9–32	83
Creatinine (mg/dl)[a]	0.1±0.07	0.1	0–0.3	84
Total protein (g/dl)	4.00±0.664	4	2.5–5.8	97
Calcium (mg/dl)	9.43±1.140	9.4	2.3–12.7	94
Phosphorus (mg/dl)	2.40±2.194	2.1	0.1–19.7	91
Uric acid (mg/dl)	7.45±3.585	6.7	1.7–15.7	95
Alanine aminotransferase (U/l)	82.9±41.26	74	31–223	83
Aspartate aminotransferase (U/l)	478.6±227.75	428	171–1,491	95
Lactate dehydrogenase (U/l)	2,305.6±1,233.23	1825	1,032–6,258	90
Creatinine phosphokinase (U/l)[a]	1,089.1±1,629.54	442	42–8,535	93
Amylase (U/l)	423.8±167.62	392	219–1,011	90
Lipase (U/l)[a]	39.5±71.08	20	5–446	88
Gamma glutamyl transferase (U/l)	11.1±2.91	11	5–20	87
Cholesterol (mg/dl)	222.8±40.68	222	147–347	88
Triglycerides (mg/dl)	95.4±21.14	95	58–192	88
Bile acid (umol/l)[a]	11.0±11.12	7.6	0.6–46.5	71
Prealbumin (g/dl)[a]	0.1±0.11	0	0–0.45	95
Albumin (g/dl)	1.777±0.5481	1.65	0.68–4.59	95
Alpha 1 globulins (g/dl)	0.440±0.2838	0.40	0.08–1.18	95
Alpha 2 globulins (g/dl)	0.590±0.0879	0.59	0.38–0.86	95
Beta globulins (g/dl)	0.922±0.2403	0.87	0.47–1.68	95
Gamma globulins (g/dl)	0.249±0.1434	0.21	0.05–0.81	95

[a] Assumptions for normality were not met for these parameters.

significantly larger than males by body weight ($P<0.001$), bill length ($P<0.001$), and flat wing length ($P<0.001$). Adult females had longer tarsal length than adult males ($P=0.002$). Means and standard deviations for hematology and plasma chemistry values are reported in Table 2. Blood parameter values did not differ significantly by age class. Female oystercatchers had significantly higher values (mean±SD) for cholesterol (241.8± 42.00 mg/dl) and alpha 1 globulins levels (0.506±0.2894 g/dl) than males (202.4± 28.18 mg/dl, $P<0.001$ and 0.362±0.2586 g/dl, $P<0.001$). Birds captured in South Carolina had significantly higher beta globulin (1.041±0.2326 g/dl) and gamma globulins levels (0.319±0.1647 g/dl) than birds captured in Georgia (0.807±0.1866 g/dl, $P<0.001$ and 0.180±0.0695 g/dl, $P=0.001$, respectively). Interactions between age and capture location could not be assessed due to the differential age distribution at capture sites. There were no significant interactions between sex and age or sex and capture location for blood parameters analyzed.

All 34 birds tested were negative for West Nile Virus exposure. Similarly, avian influenza virus was not detected in cloacal

swabs. Twenty six of 107 (24%) birds were positive for *Chlamydophila psittaci* antibody: 19 (18%) had titers of 1:5 and 6 (6%) had titers of 1:25. More *C. psittaci*-positive birds were captured in South Carolina than in Georgia ($\chi^2=8.31$, $P=0.016$) and the six birds with the highest (1:25) titers were captured in South Carolina. Antibody titers for *C. psittaci* did not differ significantly by sex or age.

Of the 95 birds tested, 28 (29%) were weakly positive for *Aspergillus fumigatus* antibody (titers = 1.4–1.6), 9 (9%) were moderately positive (1.7–2.0), and 1 (1%) was strongly positive (titer >2.0). *Aspergillus* titers did not vary significantly by sex, age, or location. Twenty eight of 88 birds (32%) tested were positive for *Aspergillus* antigen. Birds captured in South Carolina were more likely to be antigen-positive than those captured in Georgia ($\chi^2=10.31$, $P=0.006$). Birds with detectable *Aspergillus* antibody had mean uric acid values that were significantly higher than antibody-negative birds (9.31±3.564 and 6.86±3.358, respectively, mean±SD; $P=0.005$).

The mean 17ß-estradiol concentration for females (310.7±191.16 pg/ml; $n=23$) was significantly higher than the mean 17ß-estradiol concentration for males (221.1±152.03 pg/ml; $n=34$; $P=0.054$). Testosterone levels did not differ between females (441.4±365.38 pg/ml; $n=23$) and males (418.5±641.64 pg/ml; $n=34$; $P=0.88$). All blood hormone levels were measured on birds captured during the nonbreeding season.

Lead ($n=52$), tin ($n=19$), vanadium ($n=19$), chromium ($n=14$), copper ($n=19$), and strontium ($n=19$) were not detected in blood samples at the detection limits used in this study. Mercury was detected in 32/44 (73%) of the blood samples, with a median value of 0.09 ppm and range 0 to 0.23 ppm. Arsenic was detected in 5/10 (50%) of blood samples tested with a median value of 0 ppm and range 0 to 1.8 ppm. Median zinc concentration in blood ($n=19$) was 6.1 ppm with a range of 5.5 to 9.5 ppm. Mercury, arsenic, and zinc levels did not differ significantly by age, sex, or location. All blood ($n=46$) organochlorine and polychlorinated biphenyls levels were below laboratory detection limits.

DISCUSSION

This is the first published assessment of health parameters for an American Oystercatcher population. The most common finding observed on physical examination of individual birds was a ventral iridial depigmentation, which was detected most commonly and with greater severity in females. Guzzetti et al. (2008) were able to successfully determine the sex of 94% of Black Oystercatchers based on the severity of iridial depigmentation noted in field observations; however, when we applied their criteria to data collected from American Oystercatchers, we were able to correctly identify a bird's sex only 73% of the time. Our decreased success might be attributed to more variable iridial depigmentation in this oystercatcher population, misclassification due to our less comprehensive molecular sexing techniques, or the use of a molecular sexing technique not validated in this species (Ezaz et al., 2006). In contrast to previous reports, we found considerable overlap in weight, bill length, and wing length between males and females, making these less reliable indicators of sex (Hockey, 1981; Nol and Humphrey, 1994; Gill and Vonhof, 2006).

Disease information for wildlife populations is typically gathered reactively, during or after an outbreak or population decline. Baseline disease exposure information collected prior to such an event allows biologists and managers the opportunity to evaluate disease events within the context of past exposure, understand causes of die-offs, as well as characterize disease occurrence in the ecosystem over time. The birds tested for avian influenza

in this study were part of a larger surveillance study (Hanson et al., 2008) which reported negative avian influenza virus isolation for 84 American Oystercatchers captured in Georgia and South Carolina during the same time period as this study. Although avian influenza has been isolated from other species in the order Charadriiformes, our findings are consistent with species-specific and localized avian influenza infection in other shorebird species in the eastern United States (Hanson et al., 2008). In contrast, West Nile virus serologic results were also negative for all birds tested despite a documented WNV epornitic in Georgia and South Carolina during the time period of sample collection. High overall prevalences of *Aspergillus* and *Chlamydia psittaci* exposure in this population were not surprising given the ubiquitous nature of *Aspergillus* spp. spores in the environment, the worldwide distribution of *C. psittaci* in migratory birds, and prolonged antibody persistence for these pathogens (Aguilar and Redig, 1995; Cray and Tatum, 1998; Kaleta and Taday, 2003; Hubalek, 2004). Although aspergillosis has been recognized as a cause of mortality in water birds (Astorga et al., 1994; Lagerquist et al., 1994) and is frequently recognized as a disease of recently captured or captive birds (Souza and Degernes, 2005), the *Aspergillus*-positive oystercatchers captured in this study did not exhibit signs of clinical disease. Using these baseline data on disease exposure, we can monitor changes in exposure prevalence and cause-specific morbidity and mortality over time as indicators of changing population health.

Blood mercury levels in the American Oystercatchers in this study were lower than those observed in avocets and stilts from the San Francisco Bay, where there is a history of industrial mercury contamination (Ackerman et al., 2007). Like avocets and stilts, American Oystercatchers show fidelity to foraging and breeding sites despite being migratory birds (Nol and Humphrey 1994); therefore, blood mercury levels reflect short-term mercury exposure from the local environment (Evers et al., 2005). Low levels of mercury in the blood of American Oystercatchers could reflect a relatively uncontaminated prey source and nearshore environment, but changes in blood mercury levels in this population should be monitored as an early indication of environmental mercury contamination.

Filter feeding mollusks are suitable sentinel species for the evaluation of pollution trends in the environment (Gaiassi et al., 2008) and are the focus of the National Oceanic and Atmospheric Association's Mussel Watch program (O'Connor, 2002) that monitors chemical contamination in estuarine and coastal waterways. Blood contaminant levels are representative of chronic body contamination in other species (Bustnes et al., 2001) and therefore repeated exposure to contaminants in bivalve prey are likely reflected in blood contaminant levels in American Oystercatchers. Undetectable levels of PCBs and organochlorines measured in blood samples from these oystercatchers are consistent with decreasing or low levels of contaminants reported by the Mussel Watch program for sites in Georgia and South Carolina (Kimbrough et al., 2008). However, the limits of detection in this study were higher than in previous reports in other species of water birds and were likely a limiting factor in this analysis (Blus and Lamont, 1979; Van den Brink and Bosveld, 2001; Matz and Rocque, 2007).

The birds in this study apparently were healthy at capture based on clinical examination and blood parameters reported here represent baseline values for this species. Marine birds are currently recognized as indicators of marine ecosystem health for a variety of issues (Piatt et al., 2007). This health assessment of the American Oystercatcher provides the baseline data needed to monitor population health and to further characterize and

utilize the species as an environmental indicator for the coastal nearshore ecosystem of the southeastern United States.

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