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Avian Cholera and Organochlorine Residues in an American Oystercatcher

ABSTRACT: *Pasteurella multocida*, the causative bacterium of avian cholera, was isolated from cultures of the liver and heart blood of a female, adult American oystercatcher (*Haematopus palliatus*) found dead on the Cape Romain National Wildlife Refuge, South Carolina, in May 1973. This is apparently the first record of avian cholera in the oystercatcher. Low levels of DDE were identified in tissues of the oystercatcher.

Introduction

Our field studies of the effects of pollutants on estuarine birds involve determining mortality factors and their influence on populations. The first step in accomplishing this objective is to determine cause of death of the individual. Here, we document the death of an American oystercatcher from avian cholera, a disease that is an important mortality factor among wild birds. Organochlorine pollutants, such as DDE, are also responsible for many problems among wild birds including mortality, eggshell thinning, lowered reproductive success, and declining or extirpated populations (Blus et al. in press). We also document levels and interpret significance of organochlorine residues in tissues of the oystercatcher. We thank Gary Heinz and Stana Federighi for review of the manuscript.

Materials and Methods

An adult female oystercatcher was found freshly dead on Raccoon Key, Cape Romain National Wildlife Refuge on May 4, 1973. A portion of the pectoral muscles was missing, apparently eaten by a scavenger. The bird was weighed (289 g), wrapped in aluminum foil, and frozen at −20°C until it was necropsied 6 months later.

The necropsy was conducted according to the protocol used for processing bald eagle (*Haliaeetus leucocephalus*) specimens (Mulhern et al. 1970). Samples from the liver and heart were inoculated into 5% sheep blood agar; samples from the lung, oviduct, and inspissated (unovulated and desiccated) follicle were inoculated onto EMB agar.

The remaining carcass (except for skin, feet, wings, head, and gastrointestinal tract) was homogenized with a food cutter. The homogenized carcass, brain, and follicle were analyzed for organochlorine pesticides and polychlorinated biphenyl compounds (PCB's) by gas chromatography with a lower limit of sensitivity ≥ 0.1 μg/g wet weight. The analytical procedure has been described in detail by Cromartie et al. (1975).

Results and Discussion

The bacteriological cultures were positive for *Pasteurella multocida*, the causative bacterium of avian cholera. No *Salmonella* bacteria were isolated from the ovary, follicle, or oviduct.

Several tissues contained lesions that are characteristically associated with avian cholera. Fibrinous tags attached to the liver capsule, mesenteries, and serosal surface of the intestines are consistent with peritonitis. The lungs were congested and contained numerous focal hemorrhages, and petechiae and ecchymosis were present in the myocardium. Subcutaneous and abdominal fat deposits were reduced and undergoing resorbtion; coronary fat was present.

Although avian cholera has been most often reported among wild birds as an epizootic, scattered individual cases have been reported (Bivins 1953; Locke et al. 1972; Rosen 1971). There was no evidence that avian cholera was widespread in our study area. We found only one other dead oystercatcher during the summer of 1973; it was not checked for cholera because only the head was available. We found a few dead birds of other species, but cultures from those collected were negative for *Pasteurella multocida*. Isolated cases of cholera such as the one reported here indicate that the disease is prevalent over a wide area, but epizootics tend to be confined to relatively local areas where environmental conditions favor spread of the disease. This appears to be the first record of avian cholera in the American oystercatcher.

In analyzing the carcass, follicle, and brain for organochlorine residues, we detected only *p,p'*-DDE at

levels of 0.45 μg/g in the carcass and 0.88 μg/g in the follicle. These low residues posed no identifiable threat to the oystercatcher. Tomkins (1947) estimated 93% of the diet of the oystercatcher in the southeastern United States consisted of bivalves such as clams and oysters. Butler (1973) reported that eastern oysters (*Crassostrea virginica*) collected in South Carolina from 1965 to 1969 contained uniformly low residues of DDT and metabolites (maximum of 0.2 μg/g) and that the incidence of positive samples (54%) was moderately low. Residues of DDT were declining during Butler's study, and residues in oysters and other foods of the oystercatcher were probably even lower in 1973.

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Evaluation of an Air Bubbler to Mitigate Fish Impingement at an Electric Generating Plant

ABSTRACT: To determine whether fish impingement at an electric generating plant was significantly reduced during the operation of an air bubbler, impingement monitoring data was subjected to statistical analysis. Daily impingement rates were calculated for total fish collections and for three impinged species, and associated with water chemistry conditions and air curtain operation during impingement periods. Analysis for each species by season indicated that the air curtain was not an effective fish deterrent.

Introduction

The entrapment (impingement) of fish on cooling water intake screens of steam electric generating plants is an operational and potential environmental problem. Methods used to deal with this problem fall into three categories: return fish to the water source with minimal handling immediately after impingement; bypass fish at the intake screens; and prevent the approach of fish to the intake area. The use of air bubblers in front of intake structures falls into the third category and has been employed at Consolidated Edison's Indian Point Nuclear Generating Station on the Hudson River, New York since 1972.

The Indian Point Nuclear Generating facility is composed of three units located on the east bank of the Hudson River estuary at kilometer 68 near Peekskill, New York. Unit 1 has two 530 m^3/min circulating pumps, each drawing water through two intake bays. Three service water pumps with a combined capacity of 72 m^3/min draw water from each circulator forebay. Fixed screens are located at the entrance to the intake bays, with vertical traveling screens behind them. All screens are 9.5 mm square mesh.

The Unit 1 air curtain consists of four frames, each composed of a 10.2-cm vertical header, with seven 5.1-cm lateral connections in parallel located at 1.2-m intervals along its length. Each lateral connection supplies two parallel 3.8-cm horizontal headers. Air bubbles are released through 0.8-mm diameter vent holes drilled in the upper quadrants of each horizontal header at 2.5-cm intervals. The air bubbler structures are therefore designed to create a current of air which may act as a mechanical or behavioral fish deflector.

Air curtains have been tested in experimental flumes where it is possible to control an array of environmental conditions, but with variable results. Smith (1961) showed that a slow moving air curtain was an effective fish guiding device when crowding was minimal and predators were absent. Bates and VanDerWalker (1969) reported 90% effectiveness in deflection of fish away from intake structures when approach velocities did not exceed 0.6 m/s during daylight tests. The air curtain apparently acted as a visual rather than a tactile stimulus, because during night and turbid water tests, the air curtain was ineffective. Parkinson and Delachanel (1972) demonstrated on a model of the Indian Point air bubbler