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Concentrations of Environmental Contaminants in Blood Samples Collected from Sharp-shinned Hawks (Accipiter striatus) from the Eastern Flyway

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CONCENTRATIONS OF ENVIRONMENTAL CONTAMINANTS
IN BLOOD SAMPLES COLLECTED FROM SHARP-SHINNED HAWKS
(ACCIPITER STRIATUS) FROM THE EASTERN FLYWAY

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INTRODUCTION

In 1991, researchers at the Hawk Mountain Sanctuary (HMS) in eastern Pennsylvania b to our attention an apparent decline in East coast populations of sharp-shinned haw (Accipiter striatus). From 1976 to 1985, observers at the Cape May Observatory in N Jersey had counted an average of 42,000 sharp-shinned hawks during annual migration (Struve, 1992), but the counts have fallen from 35,000 in 1985 to less than 14,000 (Lenhart, 1992). Preliminary data from the fall 1992 migration shows a continuation downward trend: only 10,000 sharp-shinned hawks were counted at Cape May (Goodrich, HMS, pers. comm.).

HMS and Cape May researchers are concerned that the severity and pattern of the sha

shinned hawk decline seem to mirror the population trends observed in bald eagles c height of the DDT era: a marked decrease was observed in numbers of young bald eagl before adult numbers began to decline. Similarly, since 1985 Cape May (which normal high percentage of immature migrants) has documented a dramatic 60 to 70% decline i shinned hawks, while Hawk Mountain (which normally sees a higher percentage of adul documented its first reduced count in 1991 (Lenhart, 1992).

This pattern provides circumstantial evidence of reproductive impairment in the spe to the theory that environmental contaminants such as pesticides may be involved. H researchers requested our assistance in initiating studies to verify or refute this the limits of severe budget restraints, we worked with HMS to provide for chemical whole blood and blood plasma samples of migrating sharp-shinned hawks in an attempt determine the involvement of environmental contaminants in this problem.

METHODS

During the fall 1991 migration, HMS staff and cooperating researchers from the Tuft University School of Veterinary Medicine captured sharp-shinned hawks and collected samples. Due to budget constraints, the study was limited to ten samples for organc analysis and ten samples for mercury analysis. One milliliter of blood was taken fr jugular vein, and stored either as a whole blood sample (for mercury analysis) or c obtain an 0.5 milliliter plasma sample (for organochlorine analysis). All samples w frozen. Detailed information on blood sampling and handling procedures used at HMS study are provided in Appendix A.

Organochlorine analysis of the blood plasma samples was conducted by the Mississipp Chemical Laboratory, Mississippi State. Mercury analysis of the whole blood samples conducted by Research Triangle Institute, Research Triangle, North Carolina. Labora reports and methods are available from this office upon request.

RESULTS AND DISCUSSION

Table 1 provides the results of organochlorine and mercury analysis on plasma and w samples (respectively) collected from 20 sharp-shinned hawks at HMS (Little Gap sta Cape May Observatory. Note that mercury and organochlorine analysis were run on dif birds to minimize the amount of blood collected from one animal.

No significant levels of oxychlordane, heptachlor epoxide, trans-nonachlor, p,p'-DD were detected in plasma from any of the birds. However, DDE was detected in the blc plasma of every bird sampled from both the Little Gap and Cape May stations, at concentrations ranging from 0.02 to 0.49 ppm wet weight. The mean DDE concentration all of the birds was 0.12 ppm. Viewing Little Gap and Cape May as two separate data the mean for Little Gap was 0.18 ppm (n = 5; range 0.04-0.49 ppm), and the mean for May was 0.06 ppm (n = 5; range 0.02-0.13 ppm). Three out of the five Little Gap sam were from second-year (SY) birds, while all five Cape May samples were from hatch-y birds, leading to the higher mean value at Little Gap. The mean DDE concentration f three SY sharp-shinned hawk blood plasma samples collected at Little Gap was 0.26 p 0 06 ppm for all HY birds from both stations. Although it is tempting to conclude t must have picked up their DDE burden on their wintering grounds, the explanation fc higher blood DDE may be simply that these birds are older, and hence have had more accumulate this persistent compound.

Although we are unaware of any other studies on contaminant levels in sharp-shinned blood, similar work has been conducted on other species. The DDE levels reported fr samples are generally much lower than levels reported by Court et al. (1990) in adu peregrine falcons at Rankin Inlet, Northwest Territories, Canada (geometric mean fr

samples = 0.93 ppm), but somewhat higher than values they reported from nestlings (geometric mean for 19 samples = 0.02 ppm). Interestingly, the sharp-shinned hawk H mean of 0.06 ppm closely matches the mean values reported for HY males and females collected from 1976 through 1979 from Assateague Island, Maryland/Virginia and Padr Texas (means ranging from 0.05 to 0.07 ppm) (Henny et al., 1982). The sharp-shinnec SY DDE mean of 0.26 ppm is considerably lower than Henny et al. (1982) reported frc birds collected at Padre Island from 1976-1980 (means ranging from 0.60 to 0.67 ppm

Mercury was present in low concentrations in whole blood samples from only two of t shinned hawks. Both were HY birds captured at Cape May (one male and one female).

The small sample size precludes any further interpretation of the data.

CONCLUSIONS AND RECOMMENDATIONS

Although DDE was present in HY and SY sharp-shinned hawks collected during fall mig the small number and limited age class distribution of our sample limits our abilit deny the potential for DDE involvement in the current population decline. Neverthel because the sensitivity of sharp-shinned hawks to DDE is unknown, its presence and increase in concentration in older birds is cause for concern and warrants further In addition, more information is needed on the potential involvement of other types contaminants, such as organophosphate and carbamate pesticides.

Additional work has been started on this problem. During the 1992-1993 winter seasc continuing until September 1993, we will be cooperating with HMS and other Service locate freshly-deceased sharp-shinned hawk carcasses. These birds will be shipped t Service's National Wildlife Health Laboratory in Madison, Wisconsin, for necropsy a of tissues for chemical analysis. In addition, sharp-shinned hawk researchers will to obtain unhatched eggs for chemical analysis. We hope that these efforts will prc insights into any contaminant involvement in reduced viability or reproductive prob species.

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Table 1. Organochlorine residues in blood plasma and mercury residues in whole bloc from Sharp-shinned Hawks captured at Cape May. New Jersey (CM) and Little Gap. Penn the fall 1991 migration (September 24, 1991 through November 18,1991). All values i

See Table/Figure

APPENDIX A

BLOOD SAMPLING AND PROCESSING METHODS

Blood Sample Handling

1. Blood collected from the Right jugular vein into a 3.0 cc Monoject syringe (Lot # 228453) made of polypropylene with a rubber plunger tip fitted with a 25 GA. 5/8 inch Monoject needle (Lot #22880) made of stainless steel attached with epoxy type adhesive, with a polypropylene hub. The needle and syringe were filled with heparin, which was then expelled, leaving a small amount in the needle hub. (Sodium Heparin, 1000U/ml, Elkins-Sinn Inc. Cherry Hill, New Jersey; Lot #021070, Exp. 2/94). One milliliter of blood was collected and the blood was transferred into a 2.0 cc Vacutainer tube (Becton-Dickinson, Lots # 1B177 and 1F087); red top tubes (No additive) with a sterile, silicone-coated interior and a silicone-lubricated stopper, were used. The needle and the stopper were removed for the transfer. Tubes were recapped and held on ice in an upright position until they were processed later in the day.

2. An aliquot of blood was removed from each sample for a WBC determination, for PCV/TSP determination, and to make a blood smear. The remaining blood was then either:

   a. Stored frozen in the same Vacutainer tube at OøC as anticoagulated whole blood, or

   b. Centrifuged at G for 5 minutes and the plasma drawn into a Samco transfer pipette (Saint-Amand MFG Co., San Fernando, CA 91340; Cat.#273) and transferred to a new red-top Vacutainer tube for storage at OøC.

3. Samples were collected from 9/24/91 to 11/18/91 and stored frozen from date of collection until present, with the exception of a thaw of approximately 12 hours duration which occurred on 10/25/91 and involved samples 91-001 to 91-120.