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Organochlorine Concentrations, Whole Body Weights, and Lipid Content of Black Skimmers Wintering in Mexico and in South Texas, 1983

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Since 1978, a large proportion of the black skimmers (Rynchops niger) nesting along the Texas coast have had high concentrations of DDE in their eggs. Of 284 eggs collected from 5 sites during 1978-81, 99.5% contained detectable ($\geq$ 0.10 ppm) levels of DDE, ranging up to 86 ppm wet-weight; 36% of the eggs contained $\geq$ 10 ppm DDE (White et al., 1984). During the 4-year period, geometric mean concentrations of DDE remained strikingly similar, with no significant decline in egg contaminant levels. The sources of DDE contamination in skimmers are unknown. Recoveries of juvenile skimmers banded in Texas, Louisiana, and Mississippi indicate that a large proportion of the birds (60%) spend the winter on the east and west coasts of Mexico. Therefore, it is possible that the DDE exposure to Texas skimmers occurs in Mexico during the winter, although some birds remain along the Gulf Coast year-round.

This study was conducted to determine the degree of DDE and other organochlorine contamination in black skimmers and their food items from sites in Mexico and Texas, and to statistically compare residue concentrations and body condition in individuals from the 2 areas.

MATERIALS AND METHODS

During the period 29 December 1982 - 6 January 1983, we drove along a 1400-km stretch of the eastern Mexico coast looking for black skimmers. The difficulties in this endeavor were many. Few roads connected the main thoroughfare to the river mouths and beaches where we expected to find skimmers, boat-launch areas were nonexistent, and it rained almost continually during our 9-day search. The adverse weather conditions undoubtedly had negative impact upon our search for skimmers, since the birds probably did not move about and feed as they would have in fair weather. We found black skimmers only at 1 site along the entire route. On 2 and 4 January at Chachalacas, Veracruz (19°25'N, 96°18'W), we shotgun collected 15 specimens at the mouth of the Rio Actopan from a flock of about 50 individuals. The area around the Rio Actopan was rolling terrain with bananas being the major crop.

The birds were placed individually in polyethylene bags, tagged, and kept on wet ice. The carcasses were frozen whole on 7 January.

On 13 January, about 7 km south of Port Mansfield, Texas (26°14'N, 97°18'W), we collected an additional 15 skimmers from a flock of about 300 near the outlets of 2 agricultural drains. The birds were handled in the same manner as those collected in Mexico, and the carcasses were frozen on 15 January. Before chemical analysis, all specimens were skinned, and the feet, beaks, wingtips, and gastrointestinal (GI) tracts were removed. Unidentified small fishes were found in 5 GI tracts of the Mexico birds; these were saved for chemical analysis. Analyses were performed at the Patuxent Wildlife Research Center following the methods of Cromartie et al. (1975) and Kaiser et al. (1980). Limits of quantification were 0.1 ppm for organochlorine pesticides and 0.5 ppm for polychlorinated biphenyls (PCBs) on a wet-weight basis.

RESULTS AND DISCUSSION

Results of the chemical analyses are shown in Table 1. DDE was found in all of the skimmer carcasses, ranging up to 12 ppm in Texas birds and up to 10 ppm in those from Mexico. Geometric means were low, however, and there was no significant difference (t = 0.79, df = 28, $P > 0.05$) in carcass DDE concentrations between the 2 sites. PCBs occurred in 83% of the samples, but residues were low overall; there was no difference (t = 0.51, df = 28, $P > 0.05$) between geometric mean concentrations. Chlordane isomers were found in 6 samples (Texas = 4, Mexico = 2) and dieldrin in 2 (Texas = 1, Mexico = 1), but residues were less than 0.3 ppm in all instances. No other organochlorine compounds were detected in black skimmers.

TABLE 1. Organochlorine concentrations in black skimmer carcasses, January 1983.

Location	Sample size	DDE	PCBs
Port Mansfield, Texas	15	2.5[1] (15)[2] 1-12[3]	1.6 (14) ND[4]-10
Chachalacas, Veracruz	15	2.0 (15) 0.8-10	1.0 (11) ND-16

[1]Geometric mean.
[2]Number of carcasses with detectable residues.
[3]Extreme values.
[4]ND = not detected; samples with ND were assigned 1/2 detection limit for calculating geometric means.

Only 1 of 5 composite food samples from GI tracts of skimmers collected in Mexico contained organochlorine compounds; DDE alone was present in a 31-g food sample at 0.55 ppm wet weight. No food samples were present in GI tracts of Texas birds. However, 10 fish sample composites taken from immature skimmers at the Port Mansfield site in 1979 all contained DDE, ranging from 0.1 - 1.5 ppm (White et al. 1984).

Skimmers from both localities appeared to be in excellent physical condition. They were in good flesh, and subcutaneous and abdominal fat was present in all specimens. Whole body weights and carcass lipid content are shown in Table 2. All the skimmers collected in Mexico were males; the Texas collection had 8 males and 7 females. Texas males were heavier ($\underline{t}$ = 6.52, df = 13, $P < 0.001$) than Texas females, but there was no difference ($\underline{t}$ = 0.83, df = 13, $P > 0.05$) in carcass lipid content between the sexes. Mexico males were heavier ($\underline{t}$ = 2.47, df = 21, $P < 0.05$) than Texas males, but Texas birds (males and females combined since there was no difference in lipid content) were fatter ($\underline{t}$ = 4.38, df = 28, $P < 0.001$) than those from Mexico. There was no significant difference in wing length ($\underline{t}$ = 2.03, df = 21, $P > 0.05$) or tarsus length ($\underline{t}$ = 0.65, df = 21, $P > 0.05$) between Mexico males and Texas males, suggesting that the birds may have been from the same breeding populations. For all samples combined, there was no significant correlation (r = 0.28, df = 28, $P > 0.05$) between body weight and lipid content, i.e., body weight was not a good predictor of percentage lipid, probably because of the high variability in percentage lipid among black skimmers (Table 2).

TABLE 2. Whole body weights and carcass lipid content of black skimmers, 1983.

Location	Sample size	Sex	Body Weight (g)	Lipid (%)
Port Mansfield, Texas	8	M	359 ± 5.2[1] 336 - 376[2]	10.9 ± 1.4 3.9 - 14.6
	7	F	294 ± 8.9 268 - 334	12.4 ± 1.0 9.1 - 16.9
Chachalacas, Veracruz	15	M	386 ± 7.5 351 - 447	7.1 ± 0.5 5.0 - 10.8

[1] Mean ± standard error.
[2] Extrme values.

Overall, black skimmers we sampled in January 1983 did not exhibit elevated concentrations of organochlorine pesticides at the wintering sites although one bird at each site had 10 and 12 ppm DDE. DDE was present in all carcasses, but mean concentrations were biologically insignificant and far below those levels known to have adverse effects in other avian populations (Stickel 1973). It is a popular theory that migratory birds accumulate elevated concentrations of pesticides on their wintering grounds in Latin

America, but limited data show no clear pattern. Johnston (1975) reported finding higher levels of contaminants in some passerine species in spring after they had wintered in South America than he had found in fall migrants. Analysis of blood samples from peregrine falcons (Falco peregrinus) captured during spring and fall migration indicated that the birds accumulated most of the DDE on wintering grounds in Latin America (Henny et al. 1982). However, blue-winged teal (Anas discors) collected in Texas were relatively pesticide-free after returning from more southerly regions in the spring (White et al. 1981).

Band recovery reports indicate that most of the skimmers banded as juveniles in Texas, Louisiana, and Mississippi spend the winter in Mexico (Bird Banding Lab, Laurel, MD). It is puzzling though that only the Texas breeding population contains high concentrations of DDE. Skimmer eggs we collected in 1980 in Louisiana and Mississippi were lightly contaminated and showed average DDE levels only one-fourth that found in eggs from Texas (D. H. White, unpubl data). A likely explanation is that the primary DDE source for skimmers is the Texas coastal area. White et al. (1983b) detected exceptionally high DDE residues in gull and tern carcasses (up to 81 ppm, wet weight) from the south Texas coast, and shorebirds wintering near Port Mansfield showed significant DDE accumulation after arriving from northern breeding grounds (White et al. 1983a). Also, fishes comprising a large proportion of the skimmers' diet at Port Mansfield contained sufficient DDE (up to 1.5 ppm) to cause significant accumulation in birds feeding on them for extended periods.

Our limited data suggest that skimmers wintering near Chachalacas, Veracruz, did not encounter heavy DDE exposure. But neither did the skimmers wintering at Port Mansfield, Texas, contrary to reports for other wintering birds in that area (White et al. 1983a, 1983b). It may be that skimmers wintering in Texas feed on a different food supply or in less contaminated areas than do breeding birds feeding there during the spring and summer. An additional question arose from this study — where do female black skimmers winter in Mexico? All the birds we collected at Chachalacas were males. It is highly unlikely that females were present in the flock of about 50, since all 15 individuals shot at random over a 2-day period were males.

We found no other published reports concerning skimmer whole body weights and carcass lipid content. Average body weights and percent lipid that we report here were similar to those of birds collected in Texas in the spring (K. A. King unpubl. data). This suggests that although breeding skimmers in Texas have high DDE residues (White et al. 1984), it appears that body condition, i.e., weight and fat deposition, is as good as lightly contaminated birds collected in the winter.

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