Florida Field Naturalist

Volume 1 | Issue 2 Article 1

January 1973

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A PRELIMINARY NOTE ON ORGANOCHLORINE RESIDUES IN THE EGGS OF FISH-EATING BIRDS OF THE WEST COAST OF FLORIDA

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Although it is not our custom to publish preliminary data, especially when the sample size is small, we believe that the subject of environmental pollution is of sufficient urgency and interest to readers to do so in this case.

After accepting a position with the Mote Marine Laboratory, but before leaving his pesticide residue laboratory at Cornell University, the senior author made arrangements with local Florida scientists to collect eggs from a few representative fish-eating birds to be analyzed at the Cornell Laboratory. These collections were made during June and July of 1972 along the west coast of Florida (Table 1). The eggs of the Great Blue Heron and the Snowy Egret were collected in Little Sarasota Bay and those of the other species were collected in Charlotte Harbor. Analytical procedures for pesticides have been described by Cade *et al.* (1971) with details and slight modifications elsewhere (Lincer 1972). Since industrial contaminants called polychlorinated biphenyls (PCB's) have been found in a variety of wildlife (see Peakall and Lincer, 1970, for review) and, in particular, in a Florida estuary (Duke, *et al.*, 1970), an additional residue separation procedure (Snyder and Reinert, 1971) was necessary for these persistent chemicals.

Except for the extensive work carried out at the Environmental Protection Agency's Gulf Breeze Laboratory (450 miles northwest of Sarasota) very little has been reported on the pesticidal contamination of the estuaries of Florida's west coast. Although this is especially true for birds, two notable exceptions are the enlightening studies of Schreiber and Risebrough (1972) on Brown Pelicans and a second by Wiemeyer *et al.* (1972) on residues found in a few Florida Bald Eagle eggs. In view of this apparent dearth of information on contaminants in fish-eating birds, a monitoring program was initiated to help fill this gap in our knowledge.

The results of the first year's collection (Table 1) indicate that a wide range of DDE (the major breakdown product of DDT), PCB's, and dieldrin can be expected in the eggs of estuarine birds breeding on the west coast of Florida. It is important to understand that these egg residues, *per se,* are not the cause of the eggshell-thinning that one might observe but only reflect the residues in the female at the time of laying. That is, the organochlorine residues in the females at the time of laying are responsible for the biochemical responses (Lincer and Peakall, 1970) which result in reproductive failures involving eggshell-thinning and possibly embryonic mortality.

Any attempt to interpret data pertaining to avian pesticide residues can be foiled by the migratory behavior of the particular species and/or population being examined. The importance of the wintering grounds as a

source of contamination may be considerable. Cade *et al.* (1971) suggested the possible contribution of the wintering grounds to the total residue burden of Alaskan raptors, and Lincer and Sherburne (in prep.) reported it for the American Kestrel *(Falco sparverius)*. On the other hand, the wintering grounds may be **less** contaminated than the breeding grounds, and this was shown by Ulfstrand and Sodergren (1972) for several East African birds. The importance of this is that the residues reported here are not, necessarily, picked up on the Florida breeding grounds and, therefore, may not reflect local pollution levels. In order to elucidate this local contamination, a monitoring program has been initiated which involves collecting and analyzing more sedentary estuarine invertebrates like Fiddler Crabs *(Uca pugilator)* and the Eastern Edible Oyster *(Crassostrea virginica)* from 35 sites along the west coast of Florida.

If, however, we address ourselves to the biological significance of these egg residues rather than trying to interpret them as reflecting local contamination, at least one point becomes obvious. In this small sample at least, all species contain more DDE and more PCB's than the Brown Pelican. The low residue level found in the one pelican egg only takes

TABLE 1. Organochlorine residue levels in egg contents of selected Florida fish-eating birds collected in 1972.

Species	N*	DDE, ppm based on: OD**	DDE, ppm based on: EF†	PCB, ppm based on: OD	PCB, ppm based on: EF	Dieldrin, ppm based on: OD	Dieldrin, ppm based on: EF
Snowy Egret (Egretta thula)	1	20.9	51.0	161	392	0.9	2.2
Black Skimmer (Rynchops nigra)	2	4.50	12.1	2.10	5.75	0.15	0.30
Least Tern (Sterna albifrons)	2	3.17	8.65	11.6	31.9	0.07	0.23
Brown Pelican (Pelecanus occidentalis)	1	2.46	9.31	1.30	5.00	0.10	0.40
Laughing Gull (Larus atricilla)	3	11.70	31.70	17.2	47.7	0.61	1.59
White Ibis (Eudocimus albus)	1	9.74	31.37	9.8	35.1	0.09	0.31
Great Egret (Casmerodius albus)	1	10.36	30.63	7.5	22.1	0.06	0.18
Great Blue Heron (Ardea herodias)	1	20.0	120.	29.1	174	2.18	13.1

* N refers to number of nests sampled. One egg per nest was analyzed with the exception of the Least Tern where 2 from one nest and one from the other were sampled.

** OD refers to oven dry weight of sample.

† EF refers to extractable fat weight of sample.

on significance because it is similar to those reported by Schreiber and Risebrough (1972) for a larger sample size collected during 1970 at the same location. As those investigators pointed out, the organochlorine levels found in Florida pelican eggs are low when compared with those found in pelican eggs produced in California, Louisiana, Texas, and the Carolinas. This is commensurate with the fact that Florida boasts the only reproductively successful Brown Pelican populations in the United States. The 9 per cent reduction in mean eggshell thickness in the Florida pelicans reported by Schreiber and Risebrough has evidently not yet significantly affected reproductive success but gives reason for concern for other estuarine fish-eating birds as our preliminary work indicates that their eggs contain **even higher** organochlorine levels. To our knowledge, there are no additional residue data available on these fish-eating birds from this area nor any information regarding their comparative sensitivity to DDE in terms of eggshell thinning (Keith and Grutchy, 1972).

Because of the very real potential for sublethal effects of DDE and other pollutants on these estuarine-inhabiting birds, a more intensive study has begun. This effort is aimed toward monitoring the egg residues and shell-thinning of approximately 15 species of fish-eating birds with an emphasis on comparisons between rookeries in Tampa Bay, Sarasota Bay, and Charlotte Harbor. With several species, reproductive success will be compared to the residue levels of the respective population sampled. Time and funds providing, this project will be continued through the 1975 breeding season.

It should be noted that birds are extremely sensitive to environmental perturbations. The human animal is, unfortunately, an insensitive and often apathetic organism. If a change occurs slowly enough, he is not likely to notice it until it is too late. Like bay-filling projects (Thompson, 1961), the loss of bird populations can be compared to balding in the human male. A man's capital feathers (hairs) drop one at a time over a long period. Suddenly, approaching baldness is noted with alarming awareness and anxiety! Man has the opportunity to take heed from these avain "bioindicators" whose obvious absence or more subtle, but measurable, responses to environmental degradation (e.g. eggshell-thinning and reproductive failure) can provide a sensitive early-warning system.

We are grateful to Dr. Oliver Hewitt and Mr. William Fehring for collecting assistance. The residue analyses were done with funds provided by N.I.H. Grant ES500306, Dr. Tom J. Cade, Principal Investigator. Thanks go to the William G. and Marie Selby Foundation for support of the senior author during the preparation of the manuscript.

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BILL DEFORMITIES IN TWO FLORIDA BIRDS

Walter Kingsley Taylor

The question of whether to document in the scientific journals instances of birds with abnormally crossed bills has recently been discussed by Parkes (1969) and by Gochfeld (1972). Parkes is of the opinion that