

# PREMATURE FEATHER LOSS — A "NEW DISEASE" OF TERNS ON LONG ISLAND, N.Y.

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## INTRODUCTION

Along the shores of Long Island, the Common Tern (*Sterna hirundo*) is a common breeding bird. Several large colonies with more than 1000 pairs are known, and there are no doubt quite a few smaller ones. Within a decade the origin of new colonies and the abandonment of old ones can be observed, and this change results from overgrowth of old colonies by vegetation, human disturbance, and increases in the tern population. Some colonies may exist for several years before coming to the attention of ornithologists. A few colonies have been worked annually by bird banders during the past decade and the number of young terns banded each year probably exceeded 5000. Seasons and colonies vary in productivity, and the number of young banded or colonies investigated obviously depends on the number of active observers.

When several thousand young birds are handled one would expect to find abnormalities not infrequently. It is remarkable, in fact, that abnormalities either of genetic or developmental origin have been largely encountered among young terns. Austin (1969) commenting on a young Sooty Tern (*S. fuscata*) with extra toes, noted that this was the first such abnormality he had found in over 125,000 young birds handled. It is likely that by eliminating deleterious genes from populations, natural selection has operated to minimize the number of abnormal offspring which are produced in a population. Prior to 1970 my experience with the tern colony at Short Beach, Nassau County, New York, was that abnormalities among chicks were rare and could usually be related to some traumatic incident. I assumed that a few abnormal chicks which had died and decayed would have been overlooked, and I made only a cursory examination of unhatched eggs without finding defective embryos. In 1970, however, the picture changed markedly.

## OBSERVATIONS IN 1970

During the breeding season of 1970 I encountered several abnormalities involving absence of down or defects of the feathers or bill which were new to me. Miss Helen Hays (pers. comm) reported that such abnormalities also appeared unusually common at the Bull Island Colony of Orient Point, Long Island, where they had been rarely noticed previously. The commonest abnormality I encountered involved premature loss of flight feathers. At Short Beach 18 of 1671 chicks handled dropped their primary and secondary wing feathers and tail feathers between 3 and 5 weeks of age. At the Cedar Beach colony, Suffolk Co.,

N.Y., 8 of 302 chicks developed the same condition and Hays (pers. comm.) reported this to have occurred at Gull Island for the first time in 1970, with Roseate Terns (*S. dougalli*) as well as Common Terns affected. In retrospect, I recalled that one fledgling found in 1969 at Short Beach had apparently lost the primaries and tail feathers on one side, and that bird may have been an early case of premature feather loss. I have been unable to find a report of this abnormality elsewhere, and Dr. Oliver L. Austin Jr. (pers. comm.) indicates that he did not encounter it during his extensive work with the terns of Massachusetts. At present it appears to be a new disease of the 1970's.

The condition manifested itself about the time the fledglings learned to fly. When first observed these appeared to be perfectly vigorous young birds which were flapping and jumping and trying to fly. Only belatedly did they attempt to run, the usual escape procedure of younger non-flying chicks. When captured these birds appeared normal except for the absence of most or all of the flight feathers. Examination revealed no sign of infection or parasitic infestation, and the weights of these birds were comparable to those of otherwise normal chicks at the same stage of development. The feather-loss chicks were still being fed by their parents as late as the first week in September, but when it appeared that the parents were abandoning their still flightless young, I collected those which I could find. By this time when almost all other chicks had left the colony these feather-loss birds were very conspicuous, and it seemed highly unlikely that such birds could have been overlooked in previous years. In some cases these chicks showed new primaries developing in the follicles, and it seemed likely that such chicks might eventually be able to fly if there were adequate time for feather replacement.

A few of the retained feathers were examined microscopically and the calamus was found to be thinned and deformed, and sometimes these feathers appeared to have broken off at or near the base. Although fault bars are not rare in tern feathers, none were observed in those examined.

### SEARCH FOR THE CAUSE OF FEATHER LOSS

When considering an apparently new disease one must critically determine whether the condition might have been present in the past but overlooked. In man and no doubt most other vertebrates embryonic mortality is high during early stages of development, and estimates of fetal loss vary from 50-80 per cent of fertilized eggs. Dr. Paul A. Maderson (pers. comm.) has pointed out that the developing embryo is constantly subject to rigorous 'quality control' and is discarded when found to be unsatisfactory. Clearly defects manifest at early stages may appear only as "sterile" or unhatched eggs and are readily overlooked. Similarly the fact that defective chicks probably die early and decay quickly makes it quite likely that banders or other observers interested in live birds would

overlook them. Also banders generally do most of their field work during early July when the greatest number of bandable chicks is present, and therefore they may miss the premature feather loss which manifests itself mainly in August when most of the young have begun flying. The premature feather loss is such a conspicuous condition that even casual observers would not have overlooked it, although the significance of isolated cases might easily be missed. The first case I examined in 1970 was attributed to feather plucking by human vandals, and only when several cases were found was the significance appreciated.

Causes of diseases can be classified generally into broad categories such as traumatic, cancers, allergic, infections, genetic, nutritional, and toxic. At present the evidence regarding premature feather-loss is not adequate to allow confident diagnosis, but some observations can be made. I have found no evidence of trauma or tumors associated with the feather loss. The allergic category is most difficult to evaluate and in many instances diseases are called "allergic" only by process of elimination. My failure to isolate an infectious or parasitic agent does not really eliminate this category since a much more complete bacteriologic and virologic study would be needed. A genetic cause would be far more likely than an allergic or infectious one, but the sudden occurrence of a moderately common defect in three colonies and two species, indicates that it is probably not a genetic disease. However, it remains possible that within the populations some individuals inherit a genetic susceptibility to the unknown causative factor and that these are the birds which eventually lose their feathers.

In the agricultural and avicultural literature feather defects are most often connected with nutritional defects, and disorders involving both structure and pigment are well known. None of the disorders, however, seems equivalent to the premature feather loss of terns. Shock molt, which occurs in certain birds involving sudden loss of feathers at a time of stress, is probably not related, for those terns which retain a few feathers do not drop them when subjected to the rather extreme stress of handling and blood-taking. Riddle (1908) demonstrated experimentally how defects such as fault bars may be caused by the temporary lowering of blood pressure and consequent interference with nutrition to the developing feather. It seems not improbable that the cause of feather-loss may also act in such a manner, but perhaps at a crucial period when the calamus rather than the plume is affected. A direct nutritional deficiency seems unlikely since the 1970 season was unusually rich in the availability of fish and in the productivity of terns; but interference with the metabolism of certain nutrients may cause diseases even when the initial intake of the nutrient is adequate.

At present the most likely category is that of exogenous poisons which causes us to examine the catch-all grouping "Environmental Contami-

nants." It appears reasonable that some such contaminant, which has increased in the terns' environment recently, may effect their development, resulting in feather-loss and perhaps in some of the other abnormalities noted as well. It is not presently apparent what such a compound might be, for none of the well-studied environmental contaminants have been previously implicated in feather abnormalities.

### MERCURY LEVELS IN TERNS

At our Environmental Laboratory at Columbia University's School of Public Health, using the method of Jacobs et al (1961), we had been doing industrial surveillance of mercury in workers for more than a decade. It seemed reasonable, therefore, to look first at mercury. The results were surprising, and the details will be presented elsewhere (Gochfeld and Hoover, in prep.). We found that all chicks had mercury present in more than trace amounts in the blood and tissues. The levels were comparable to those found in Sweden, the country where mercury has been most intensively studied, (Borg et al, 1966; Berg et al, 1967). However, we also found that four affected chicks had a mean value of 63.7 (S.D. = 19.3) micrograms of mercury per 100 c.c. of whole blood, compared with a mean of 26.8 ug/100 c.c. (S.D. = 9.7) in ten non-affected birds that had died of trauma. This relationship *does not* in any way indicate that mercury causes the feather-loss, although the differences were found to be statistically significant using both a t-test and a Rank test. More detailed analyses involving larger samples and other tissues are necessary, for it remains possible that the association will break down when more data becomes available. To adequately establish a causal relationship one would have to produce the feather-loss in birds by feeding mercury. Tejning (1967) did extensive experiments on feeding methyl mercury to chickens and did not encounter any condition suggestive of feather-loss. In most cases, however, he was working with adults, and since I have found a few adult terns with blood mercury levels in excess of 100 ug/100 c.c. (Gochfeld, unpublished data) without signs of feather-loss, it is apparent that experiments involving young birds would be desirable.

### DISCUSSION

Assuming that the apparent association between mercury levels and feather-loss is not spurious, it is possible that mercury is only an indicator of pollution which accumulates in young of certain adults which habitually fish in places that are polluted and thereby provide their chicks with a variety of exogenous compounds. Whether certain adults habitually fish in certain areas is unknown, but clearly the distribution patterns of feeding adult terns would need careful study. Dr. Ian C. T. Nisbet is presently studying this behavior in Massachusetts (pers. comm.). It is also possible that mercury may interact with one or more other factors in

a synergistic fashion to produce disease, and finally it is not impossible that both feather-loss and high mercury levels are themselves manifestations of a disease. We are presently examining preserved tissues for thallium (a compound known to produce hair-loss in humans) and a variety of other heavy metals, and specimens from Gull Island will be analyzed for chlorinated hydrocarbons by Dr. Robert W. Risebrough.

As more and more field observers become cognizant of this condition it is likely that it will be recognized elsewhere and in other species of birds, and this data will be very valuable in helping track down the cause. No doubt we will learn that such birds have been found from time to time in the past but have not been considered significant. At present we are faced with an apparently new and local, clearly defined, disease occurring in young terns, and with an unexplained statistical association between feather-loss and levels of mercury. The need for much more extensive study is evident, and the work is both slow and expensive.

#### ACKNOWLEDGEMENTS

I wish to thank Mr. Robert Gochfeld and Miss Danielle Ponsolle for invaluable assistance in the field and I am indebted to Miss Jean HERNON for her patience and efforts in the continuing laboratory analysis of the abundant material. I thank Drs. Leonard J. Goldwater, A. Walter Hoover, and Wesley E. Lanyon for their comments on earlier drafts of this manuscript, and Mrs. Mary LeCroy and Miss Helen Hays for numerous discussions of the new abnormalities.

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#### ADDENDUM

Premature feather-loss occurred again in 1971 in the same three colonies, and in two additional smaller ones in Nassau County. At least one large colony in the same area appears to be free of feather-loss. The incidence of the disease was similar to that in 1970.

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## 1972 WATERFOWL COUNT DATES

The annual Federation Waterfowl Count will be held from Saturday, January 15 to Sunday, January 23, 1972. Target date is Sunday, January 16. Please send your count results to John L. Mitchell, 345 Conrad Drive, Rochester, N.Y. 14616 as soon as possible after the count period.

## LABORATORY OF ORNITHOLOGY PLANS SURVEY

At the top of the aquatic food-chain, the Great Blue Heron may well be an important indicator species. The Laboratory of Ornithology is planning a nation-wide survey of this species.

The first step will be to compile an inventory of heronries. To this end, we appeal to all readers with knowledge on this point to write to us. Information may be recent or old; detailed or sketchy. Even "I remember seeing a heronry as a boy" is helpful if the site is remembered well enough to locate on a topographic map.

We hope that this inventory will contain the exact locality of the heronry, a general description of the site, and as much history as possible. We hope that this stage of the program can be completed by the winter so that arrangements can be made for census work in the 1972 breeding season.

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**Correction and Addendum to May, 1971, Membership List:** Mrs. Dayton Stoner is a Patron of the Federation, its first, as well as being a Charter Member and Life Member. Our sincere apologies for this omission. — *Ed.*