

After a long rest and large lunch, the birders became more enthusiastic over a Blue Grosbeak said to have been spotted by Mrs. Louise Hoffman. An unrewarded search for the bird turned up only Titmice, Bobwhite, Carolina Wrens and more perspiration. At 1:30 we started home.

I would like to thank Jim Ellis for going to a great deal of trouble to obtain permission for us to bird in this area. Besides Jim, the birding party consisted of his wife Pat, Louise and Henry Hoffman, Bill Harwell and son Bill Harwell, Mable Deshayes, Irving Greenbaum, Josephine Wilkin, Thelma Smith, Victor Emanuel, Karen Morse, Ralph Hunter, Mary Sears and George Sibley.

(Ed. comment - Only a small amount of condensing was needed for this fine job of reporting by 14 year old George Sibley.)

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PEOPLE ARE TALKING ABOUT:

The wonderful photograph of the Eskimo Curlew taken in Galveston by Don Bleitz and published in Audubon Magazine this month!

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HERE AND THERE WITH BIRDS AND PEOPLE (where are they?)

There is a very large colony of nesting skimmers, gulls and terns on a spools clump off the mouth of Cross Bayou about three miles east of Barrow's Point. Because of high tides earlier it is still very active.

Arlie K. McKay

Again, unusual reports of geese from the Cove area - Blue Goose (2) 17 on Lost Lake seen by Homer Harmon and a White-fronted Goose seen in mid-June by W. E. Clark. Arnold McKay saw a pair of Mallards several times.

submitted by Arlie K. McKay

The following article is from a research theme done by Drew Snyder at the University of Texas. In the interest of space, footnotes will be omitted, but a complete bibliography will be published at the end.

RECENT THEORIES AND EXPERIMENTS ON HOW BIRDS NAVIGATE DURING MIGRATION
by Drew Snyder

Part I.

From the time of Aristotle, it has been known that birds migrate in some manner, but the Greeks never realized the extent or accuracy of this migration. Today, however, it is known that most birds repeatedly migrate anywhere from 1000 to 3000 miles to the same locale every year. A few species do not migrate at all, while others navigate several thousand miles over the average. Such a distance flight is made by the Arctic Tern, which in its roundtrip from the Arctic Circle to Antarctica covers 24,000 miles. The entire trip takes ten months. Since most birds migrate and returned to the same place year after year, great accuracy in navigation must be possible. A good example of this precision is the Manx Shearwater which was flown from England to Boston and released. In twelve days and thirteen hours it was found on its nest 3200 land miles away.

Scientists have proposed numerous theories to explain the navigation of birds over these great distances with such accuracy. The difficulty in explaining this phenomenon, though, lies in gaining proof through controlled experimentation. It is the purpose of this paper to explain these modern theories and to cite some of the recent experiments conducted to support the theories.

There are three major and numerous minor schools of thought concerning bird navigation. The first major theory has to do with the variations in the Coriolis force over the surface of the earth. The sun-arc method, one of the soundest theories, is based on the belief that birds can accurately determine the angle of the sun and can correlate this angle with the time of day. Celestial navigation is closely related to the sun-arc method. Instead of navigation by the sun, birds position themselves by celestial

orientation. Some of the minor theories are based on inherent ability, extrasensory powers (psi), homing ability (direct vision), infrared light sensitivity and changes in terrestrial magnetism.

The scope of this paper is narrowed by placing the emphasis on the major theories. These three theories are most prominent today and are the only ones that have substantial backing of valid experimental results. The others are entirely too shallow to offer much of an explanation of the intricacies of navigation.

This paper is intended to be read by anyone interested in the subject of migration. Although major emphasis is put on the theories of navigation, a brief summary of the entire process of migration has been included to give little-known information about its real complexities. Included in this summary are an extended definition of migration, its cause, stimulation and correlation to weather. Only a basic knowledge of biology and physics is needed to comprehend most of the material presented. If the curiosity of the reader is greatly aroused by this paper, he should refer to the original sources of the paper for a fuller understanding of bird migration.

Definition of Migration

Bird migration is any regular seasonal movement of birds between two areas. Twice each year, once in the spring and again in the fall, birds perform this movement, which is one of Nature's remarkable feats. This biannual migration is a phenomenon in which millions of birds are provoked by some stimulus to leave their nesting grounds in the fall, navigate over thousands of miles of hostile environment, spend the winter in a more temperate climate and return to their breeding grounds in the spring.

Migration is a process which occurs virtually at all times of the year and at all hours of the day and night. Birds that migrate at night are called nocturnal migrants, while those that travel by day are known as diurnal migrants. As a rule nocturnal migrants are small, weak flyers, who use their daytime hours for feeding and the cover of night for protection from hawks and other enemies. Diurnal migrants -- swallow, finches, thrushes and hawks -- tend to be swift flyers, feeding at dusk.

Spring migration begins in early February with the arrival of the Purple Martin in the South; migration does not become evident, however, until early March when the first warblers arrive. By April spring migration is at its peak. Its termination occurs late in May, with fall migration beginning soon afterwards in July. Fall migration is a much more leisurely passage than the relatively short and concentrated spring migration. The subtleness of fall migration is increased because birds at this time of the year are silent and dull-colored.

The rate of flight during migration is irregular not only among species but also among individuals of the same species. It varies from 15 to 59 mph. Since travel consists mainly of short flights alternating with long rest periods, actual flying time per day rarely exceeds 10 hours. The general rate of travel is unhurried and arbitrary. If an excellent food supply is encountered, birds will stop over for a few days of feeding and resting. If, on the other hand, birds are migrating just ahead of a severe storm, speed is of utmost importance. Once, under these conditions, a flock of ducks flew 1800 miles in two days. Another instance of hurried migration occurs when birds migrating over oceans are forced to travel great distances without landing.

Cause of Migration

The first basic concept concerning bird migration is its cause. The two possibilities that naturalists agree on are environmental factors and historical bases.

In North America as the fall sets in and the temperature, day-length and food supply decrease, the north to south migration of birds becomes evident. Similarly in the spring, as these environmental factors increase, the migration from south to north is evident. From these observations one might conclude that migration is a process caused by a decrease or increase in food supply, temperature and day-length. A brief survey of the migrational picture, however, shows that some species migrate when the opposite conditions are true. Also, some species do not migrate north and south; and others migrate irregularly or not at all. Consequently, one might safely conclude that migrational habits for different species have developed independently, although certain environmental conditions do dictate the pattern.

A number of ornithologists have sought to explain migration on a historical bases. Some believe that migration was initiated 25,000 years ago during the Ice Age, when birds were forced to migrate southward. They then instinctively returned northward the following spring. This, therefore, established the migrational cycle. Opposing groups believe that all birds lived in the tropics, became overpopulated and migrated to the virgin lands of North America. Unquestionably, historical and environmental factors have influenced migration; but one factor alone is not responsible for the process. Each species has gradually developed a migratory pattern on a genetic bases.

Stimulation for Migration

Although the cycle of migration is caused by a complex arrangement of historical and environmental factors, a stimulation is needed before the process can begin. The current theory concerning the impetus for migration is fairly well defined.

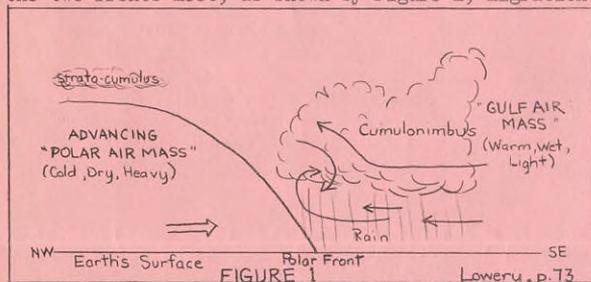
In the spring the lengthening of the photoperiod (period of daily illumination used for the growth and maturity of an animal) and the increase in temperature cause an improvement in the metabolism, or energy balance, of the bird. As the bird needs less food to keep it warm and the food supply becomes more abundant, the bird builds up fatty reserves for the journey. The anterior pituitary gland is then stimulated by the increase in light received through the eye and hypothalamus (ventral part of the forebrain including the pituitary glands). The hormones which the pituitary secretes in turn stimulate the gonads and thyroid glands. As these hormones move into the bird's system, they bring the bird into a physiological condition necessary for migration. The condition, known as Zugdisposition, is characterized by an accumulation of fatty reserves, an ability to restore these reserves and a tendency to develop nocturnal restlessness. The continued persistence of Zugdisposition and the influence of some environmental stimulus releases the behavior.

In the fall after breeding season, again these fatty reserves develop as the bird enjoys a favorable energy balance. The difference, however, is that the pituitary gland is inactive, thus leaving the thyroid glands and gonads unstimulated. The favorable metabolic balance again leads to Zugdisposition. Probably an external stimulus such as a drop in temperature will initiate the migratory behavior.

Correlation of Weather

As implied earlier in the paper, weather conditions have a great influence on migration. Naturalists have recently correlated flights with both frontal systems and meteorological variables.

Recent studies have shown that spring migration begins with the onset of warm fronts, while fall migration follows cold fronts. Characteristics foretelling the approach of a warm front are a drop in barometric pressure and a flow of warm moist air from the south, the direction from which spring migration begins. With the approach of a cold front (a high pressure area), air turbulence develops and migrational movements slow down. When the two fronts meet, as shown by Figure 1, migration ceases until the high passes. In the fall the pattern reverses and heavy migration follows a cold front of continental polar air from the north. With the advent of a warm front, migration ceases until another cold front passes.



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The reason for this behavior in relation to fronts comes from another series of studies which correlate two meteorological variables with spring migration. These two variables are wind direction and air stability.

The experiment showed by the release of birds under varying conditions (see

CONDITIONS	NO. OF BIRDS	% THAT MIGRATED	PROBABILITY OF MIGRATION (%)
STABLE AIR FAVORABLE WINDS	98	64	38
UNSTABLE AIR FAVORABLE WINDS	98	10	19
STABLE AIR UNFAVORABLE WINDS	98	24	29
UNSTABLE AIR UNFAVORABLE WINDS	98	2	14
CORRELATION BETWEEN WEATHER CONDITIONS AND MIGRATION CHART I.			

Chart I) that migration normally takes place with favorable winds in stable air. Favorable winds are those more with than against the assumed flight direction. Stable air exists when there is an inversion, or an increase in atmospheric temperature with height. Inversions eliminate turbulence and vertical motion of air, thus creating ideal conditions for migrating. Since cloudiness and high wind speeds prevent inversions, the meeting of two fronts does not allow these favorable conditions to develop. Consequently, birds halt migration until the stable air following a front arrives.

to be continued

CLEARING HOUSE

June, 1962

Cattle Egret - (2) 3 EM
 Ibis, Wood - (7) 6 Baytown Tunnel IS
 White-faced - (20) 3 EM; (80+) 27 Cove AKM
 White - (60) 3 EM; (125+) 27 Cove AKM
 Roseate Spoonbill - (3) 3 EM; (1) 27 Cove AKM
 Duck, Mottled - (1) 2, (2) 7, (3) 8, (6) 24, (50+) 27 Cove AKM
 Blue-winged Teal - (4) 27 Cove AKM
 Pintail - (1) 24, 27 Cove AKM
 Wood - (4) 20 Cypress Creek Lake BH; (10+) 24 Cove AKM
 Swainson's Hawk - (1) 17 EM
 Rail, Clapper - (1) 3 EM
 King - (1) 27 Cove AKM
 Purple Gallinule - a colony heard daily till June 6 when they must have hatched off - Cove
 AKM
 Lesser Yellowlegs - (1) 27 (early) Cove AKM
 Tern, Gull-billed - (2) 4 Bayshore IS
 Common - (65) 2 all over Galveston Bay IS, CS, (5) 4 IS
 Black - (2) 21, (10) 22, (20+) 27, (5) 28, (1) 29 Cove AKM
 Inca Dove - (1) 8, 10, 28 Spring Branch area JH, BH
 Owl, Screech - (1 to 2) frequently Cove AKM; (1 to 2) most days Bayshore IS
 Horned - (1) 8, 25 Cove AKM
 Ruby-throated Hummingbird - (1) in my yard for three weeks - Cove AKM;
 (1) 14 Bayshore IS
 Crested Flycatcher - (1) most days Bayshore IS
 Wood Thrush - (1) most days Bayshore IS
 Painted Bunting (1) 3, 16 EM
 White-eyed Vireo - (1) 14 Bayshore IS

Credits

BH - Bill Harwell
 AKM - Arlie K. McKay
 EM - Elric McHenry
 CS - Clint Snyder
 IS - Linda Snyder

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