On "thunder-flights" of the House Martin *Delichon urbica*

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It is well known that some birds react very sensitively to approaching bad weather by migratory movements even during the breeding season. This is especially true for species which, owing to their dependence on air plankton, spend much of their life on the wing. The Swift is a classic example of species known to perform such "weather flights", as was first shown by KOSKIMIES (1947, 1950) and later corroborated by other students (SVÄRDSON 1951, LACK 1951). UDVARDY (1954) noted the same phenomenon in the American black swift *Cypseloides niger*. It is suggested (DORST 1962) that Apodiformes in general perform such flights. The weather flights of these birds may be regarded as regular behaviour for avoiding areas of temporarily diminished food supply.

As first suggested by RAMEL (1960) and later by LIND (1960), the swifts are not alone, however, in their ability to avoid areas of unfavourable weather conditions. Swallows, such as *Riparia riparia, Hirundo rustica,* and *Delichon urbica* also display their sensitivity to the weather by flying in the "wrong" direction (as does the Swift, too) during ordinary migration or by disappearing from their nesting places for a short time. In the case of migration, the principal stimulus is probably not only the low temperature but also the wind against which swallows (and swifts) fly for their strong anemotaxis (RAMEL op.cit.). In the latter case, however, the main reason for leaving the home area lies in the need to find areas where there is no temporary food shortage. This does not exclude, however, the fact that also in flying against the wind anemotactic behaviour is connected with the possibility of harvesting air plankton without interruption. For birds of such a small size as swallows and swifts, which use gliding flight when catching plankton, flying against the wind is a necessary, or at least more effective, method of feeding for aerodynamic reasons. These birds may, therefore, be particularly sensitive to air currents as suggested by RAMEL (1960).

This general sensitivity is well reflected in the readiness with which the birds react to sudden atmospheric disturbances of even a minor extent, such as local showers of rain. In such cases e.g. swifts rapidly form flocks and fly against the wind and rain (SVÄRDSON 1951). It is no wonder, therefore, that a thunderstorm approaching the nesting area immediately releases the instinctive behaviour to manifestly "bad weather", which is characterized by massive formations of dark clouds. Besides swifts, House Martins *Delichon urbica* are known to be birds which react violently to an approaching thunderstorm.

Though this very characteristic behaviour of House Martins has certainly been known for a long time, there is little mention of it in ornithological literature. The oldest mention known to me is that made by SEPPÄ (1922) who briefly describes this behaviour as well as the usual flight technique of the House Martin as follows:

"The Swallow uses a flapping flight, the House Martin a good deal more gliding flight. The House Martin usually flies rather high and, strangely enough, often rises very high

before the rain (e.g. thunderstorm) while the Swallow flies near the surface of the earth" (p. 202, Orig. in Finnish).

Recently, in a paper on the behaviour of the House Martin, LIND (1962) has cast interesting new light on this phenomenon. He attempts to unravel its biological significance by connecting it with the general behaviour (vocal communication, flock formation and so on) of the species.

The aim of the present paper is to consider the topic on the basis of some personal observations made in the field and to present some viewpoints in addition to those of LIND's paper, which provided the stimulus for this study.

Personal observations

The following two observations relevant to our topic were made in the commune of Taipalsaari in south-eastern Finland (61°N, 28°E) during the summer of 1969. They are quite occasional in character and the size of the breeding population is not known to estimate the relative frequency of individuals participating in the flight movements observed. However, the meteorological conditions were, at least apparently, rather different during the two observations. The observations may thus be considered useful from the point of view of this paper particularly because the behaviour of the birds was essentially similar in both cases.

Observation 1. June 28th, at 3 o'clock in the afternoon. Thunderstorm approaching from WNW. More than 10 individuals of *Delichon urbica* were observed flying at great height in the vertically rising air current *in front* of the approaching thunderhead. They gave their flight call, which is very typical in this situation, and kept calling clearly even from great heights during calm periods. The birds kept continually in front of the brightly-lit part of the advancing thunder-cloud. They did not drop behind the cloud nor even beneath the darker front part where it was not raining, but moved in ESE direction over a lake in sunny weather until they passed out of sight. At nearly the same height, a couple of Swifts *Apus apus* were seen in front of the cloud but these remained under the dark cloud (where it was not raining) for a time before disappearing. In addition, several gulls *Larus canus* and *ridibundus* circulated at a lower height and clearly caught the insects driven far above the forest when the dark belt of the cloud where there was no rain passed over. One gull was detected flying very high together with the House Martins in front of the thunder-cloud. — Temperature during the passage of the thunderstorm: at the beginning, +26°C; on the approach of the cloud, +25°; after the first gust of wind and the first shower, +21°; forty minutes later (when raining), +19°; after the thunderstom at 4 o'clock (still raining a little), +18°C.

Observation 2. August 13th, at a quarter to two in the afternoon. Sunny and calm weather, temperature +26—27°C. No thunder but a small patch of cloud, dark at the base, giving rise to a notable whirlwind approaches in a NNW-SSE direction. In the vertically rising air current (indicated by a yellow birch leaf soaring upwards high above the forest trees) more than 20 noisy House Martins were seen flying at different heights, the ones at the top flying very high.

During the passing of the whirlwind, dragonflies also rose considerably higher, up to and over the tree tops. Their catching activity was clearly increased during the time the rising air current passed over.

The problem

Though the observations made were very few they, nevertheless, reveal certain points raising problems of ecological interest. Bearing in mind the similarity of behaviour of the House Martins and the apparent difference in meteorological conditions during the two events observed, we may ask a series of questions.

Though House Martins seemingly react to an approaching thunderstorm in much the same manner as Swifts do to "bad weather", why do they also perform similar "weather flights" in the case of a whirlwind, very limited in area, without any considerable cloud formation? Why do Martins tend, in the case of a thunderstorm, to keep themselves continually in the front of the approaching cloud and perform their rising flight manoevres in sunny weather? Why does

behaviour of this kind seem to be a characteristic of House Martins (together with Swifts) while Swallows *Hirundo rustica* regularly avoid higher altitudes in corresponding situations?

Supposing that the observations reported above adequately disclose (which they possibly do not) the essential behaviour of House Martins, our attention is fixed upon the common denominator of the two events described. What matters is, first, that in every case the external conditions were characterized by rising currents of warm air certainly containing relatively large amounts of air plankton (as indicated by the presence of Swifts and the smaller gull species as well as by the behaviour of the dragonflies). The second point is that either a massive thunderhead or a dark patch of cloud caused by a local upward burst of warm air (cumulus about to begin) formed the (at least potential) visual cue eliciting the flight reaction of House Martins. This does not exclude the possibility, however, that the rising air currents by themselves may be sufficient to elicit this response in these birds which are supposedly sensitive to air currents in general (see above).

Thus, whatever the stimulus leading to the series of events connected with the thunderstorm, at least two advantages are attained by House Martins through their behaviour: they are able to avoid bad weather for a time at least, and they can find areas abounding in food. Our problem, then, is which of the two adwantages is the primary reason for the evolution of such behaviour. In other words, though ultimately serving the same purpose (getting food), we may ask whether these "thunder-flights" are to be understood as ordinary weather flights in a shortened or rudimentary form, or whether they are a totally different phenomenon serving more immediate ecological needs.

Discussion

According to LIND (1962), the reaction of House Martins caused by an approaching thunderstorm closely resembles that elicited in them by a falcon. He in fact discusses the matter in connection with the behaviour of House Martins towards their enemies. But, as pointed out by LIND (op.c.), this resemblance is restricted to the first and weakest stage of the vocal communication system for warning, i.e. to the strong flight-call only. This observation is very important. The strong flight-call released by an approaching thunderstorm is used in many different situations, and it regularly signifies the beginning of a new type of activity caused by a changed outward situation. So it is not any warning situation that matters, but a case of communication which synchronizes the function of the flock for exploitation of an occasional situation which is ecologically important in some other respect.

It is known that, during the migration period, Swallows and House Martins perform weather movements comparable to those of Swifts (RAMEL 1960). LIND (1960) has shown that the House Martin, though sedentary during the breeding season and unable to avoid extended periods of bad weather, nevertheless performs such flight movements in a restricted form. These comprise short migrations to the nearest sizeable watercourse during cold weather. LIND (1962) suggests that the "thunder-flights" of the House Martin represent a special case of such migrations for escaping unfavourable weather conditions. He also thinks that the significance of the rise of the Martins might be that the birds can in this way orientate themselves to the width of the rain belt and fly to good weather.

I am not trying to refute this explanation as a part of the truth. The massive

cloud formation of an approaching strong rain belt or of a thunderstorm may well serve as a visual stimulus for a flight reaction. But there is a difference between the two meteorological events. Thunderstorms are characterized by vertical air currents which are favourable thermally as well as in terms of food ecology. It is equally possible that the behaviour of House Martins as regards a thunderstorm has evolved as a response to differences in temperature connected with air currents of a particular character.

This is supported by the following facts. As has been shown by LIND (1960), House Martins are sensitive to temperature differences as is seen from their behaviour during cold weather when flying near the surface of lakes and rivers. By this "low flight" just 5 to 10 cm over the surface they keep themselves oriented to the temperature and catch the insects which abound, owing to their thermofilic reaction, within the air space warmed up by the slowly cooling water masses. The behaviour of the Martin, in the case of the summer whirlwind, shows that upward currents of warm air are a sufficient stimulus for their assembled vertical flights. This observation is in harmony with the concentration of their "weather flights" in front of a thunderhead where upward currents of warm air dominate. Though swallows in general appear to be sensitive to the air currents as mentioned before (RAMEL 1960), the House Martin differs from the Swallow in its flight technique. It is much more inclined to use gliding flight and, therefore, more apt to take advantage of rising air currents. As it generally harvests the air plankton from higher altitudes than other swallows, it is by nature preadapted (contrast *Hirundo rustica*) to widen its ecological niche to include rising air currents in its normal range of feeding activity.

To conclude, in a species with a high metabolic rate such as swallows, the behaviour is readily adjusted to respond to new kinds of sensations if the latter contribute, separately or in combination, to more effective exploitation of food energy. In the House Martin, the evolution of its special habits is probably connected with the more immediate needs of the food ecology of the species and not to be considered as a modification of the ordinary weather flight so effectively utilized by Swifts.

Summary

The House Martin is known as a species reacting violently to an approaching thunderstorm by gathering in a flock and rising very high in the air.

The aim of this paper is to consider the phenomenon on the basis of observations made in the field and to present some viewpoints concerning the stimuli releasing the behaviour and the biological significance of such flights.

It is not impossible that an approaching thunderstorm with massive cloud formations acts as a visual stimulus releasing the behaviour. The fact, however, that House Martins perform similar flights also in the case of a localized whirlwind without any considerable cloud formation suggests that rising air currents of warm air suffice to elicit the response through anemotaxis or thermotaxis or through both in combination. This is supported by the concentration of the "thunder-flights" in front of the thunderhead where upward currents of warm air prevail.

As the vertical currents of warm air are favourable not only thermally but also in terms of food ecology, it is suggested that the House Martin, which generally harvests the air plankton at higher altitudes than other swallows, is by its nature preadapted to widen its ecological niche to include rising air currents in its normal range of feeding activity.

The thunder-flights have probably evolved as synchronized changes of activity for immediate and thus more effective exploitation of

food energy in occasional though recurring situations. They cannot be considered as modifications of ordinary weather flights occurring during cold weather.

Selostus: **Räystäspääskyn "ukkoslennoista".**

Räystäspääsky on tunnettu lajina, joka voimakkaasti reagoi lähestyvään ukkossäähän kokoontumalla parveksi ja nousemalla korkealle ilmaan.

Kirjoituksessa tarkastellaan ilmiötä parin kentällä tehdyn havaintosarjan ja siitä aikaisemmin esitettyjen käsitysten pohjalta ja esitetään eräitä näkökohtia käyttäytymisen laukaisevista ärsykkeistä ja ukkoslentojen biologisesta merkityksestä.

On mahdollista että lähestyvä ukkonen massiivisine pilvimuodostuksineen toimii näköärsykkeenä, joka laukaisee puheena olevan käyttäytymisen. Kuitenkin se havaittu tosiasia, että räystäspääskyt suorittavat samanlaisia lentoja aivan paikallisen pyörretuulenkin sattuessa ilman mainittavaa pilvimuodostusta, osoittaa että ylöspäinen, lämmin ilmavirtaus sinänsä jo riittää laukaisemaan toiminnan. Tätä olettamusta tukee se, että "ukkoslento" keskittyy ja jopa rajoittuu ukkospilven edessä olevaan ilmatilaan, missä ylöspäin suuntautuva lämmin ilmavirtaus on vallitseva.

Ylöspäin suuntautuvat ilmavirtaukset ovat kuljettamansa runsaan ilmaplanktonin vuoksi myös ravintoekologisesti edullisia. Muita pääskyjä säännön mukaan paljon korkeammalla hyönteisravintoa (ilmaplanktonia) saalistava räystäspääsky, joka sitä paitsi lentotapansa vuoksi muita pääskyjä paremmin pystyy käyttämään hyväkseen ylöspäisiä ilmavirtauksia, on katsottava ennalta sopeutuneeksi (preadaptoituneeksi) laajentamaan ekologisen lokeronsa käsittämään myös nousevat ilmavirrat normaalin ravinnonottotoimintansa alueina.

Räystäspääskyn ukkoslennot ovat ilmeisesti kehittyneet enemmän tai vähemmän tilapäisen, mutta ravintoekologisesti tärkeän tilanteen hyväksikäytön kannalta mielekkäänä synkronisoituna toiminnan muutoksena eivätkä ole katsottava — kuten on arveltu — muuntuneiksi säälennoiksi, jotka tervapääskyllä esiintyvät voimakkaasti kehittyneinä ja joita myös räystäspääskyt tietyssä mitassa suorittavat lyhyinä jaksoina järvenselkien ylle kylmän sään sattuessa.

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