STUDIES ON THE INFLUENCE OF WEATHER ON MIGRATING CRANES (GRUS GRUS) IN SWEDEN

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It is commonly said that, as a distinguishing feature, storks are separated from cranes by their dependence on up-currents, and that cranes are able to travel independent of thermals.

Factors influencing continued migration

In reality, the migratory behaviour of the cranes in Sweden makes it clear that soaring flight and up-currents are very important in crane migration too. Severa factors exert their joint effects at Scandinavian staging places.

The primary factor for initiating continued migration from a stage is, of course, the timing of their internal programme, of their hormonal and physiological readiness, which is related to the season of the year.

A second factor is evidently the trend to make the true migration in long-distance, energy-saving flights between favourable stages.

This second factor is, in turn, dependent on a third factor, that is local weather providing favourable conditions on the day, and which is important, at the right hours of the day.

In springtime this is evident in southern Sweden. In the staging area around and on Rügen, from late March the Swedish cranes wait for the right time to continue their migration into the Swedish climate. When the day comes, they take off some hours after sunrise (radar echoes by *Alerstam—Bauer,* 1973, field observations by *H. U. Dost,* in litt.). When they are internally ready and there is a day with favourable weather, their flight may proceed as in fig. 1. About 1000 cranes started successively in the morning of that April day, and thanks to numerous reports we were able to follow their progress to the stage at Hornborga. They passed the southern coast of Sweden at about 11.00 hours, and the wave was then continuously recorded until 700 of the birds, group by group, could be watched arriving at Lake Hornborga between 17.00 and 19.30 hrs.

The remaining 300 birds had met weather that had delayed them. As they did not reach their destination before dusk, they stopped on the way for overnight rest. It is interesting and characteristic that those cranes which failed to reach their goal for the day, did not wait until the next day for favourable weather, such as is needed for initiating the real start of a long-distance flight from a stage. Instead, early the following morning, they took off to finish their interrupted flight. Shortly after 07.00 hrs in the morning they began to arrive at their pre-determined assembly place. In spite of snow at times, and a strong headwind, they arrived within the next few hours. Some of them showed obvious signs of exhaustion from the wind.

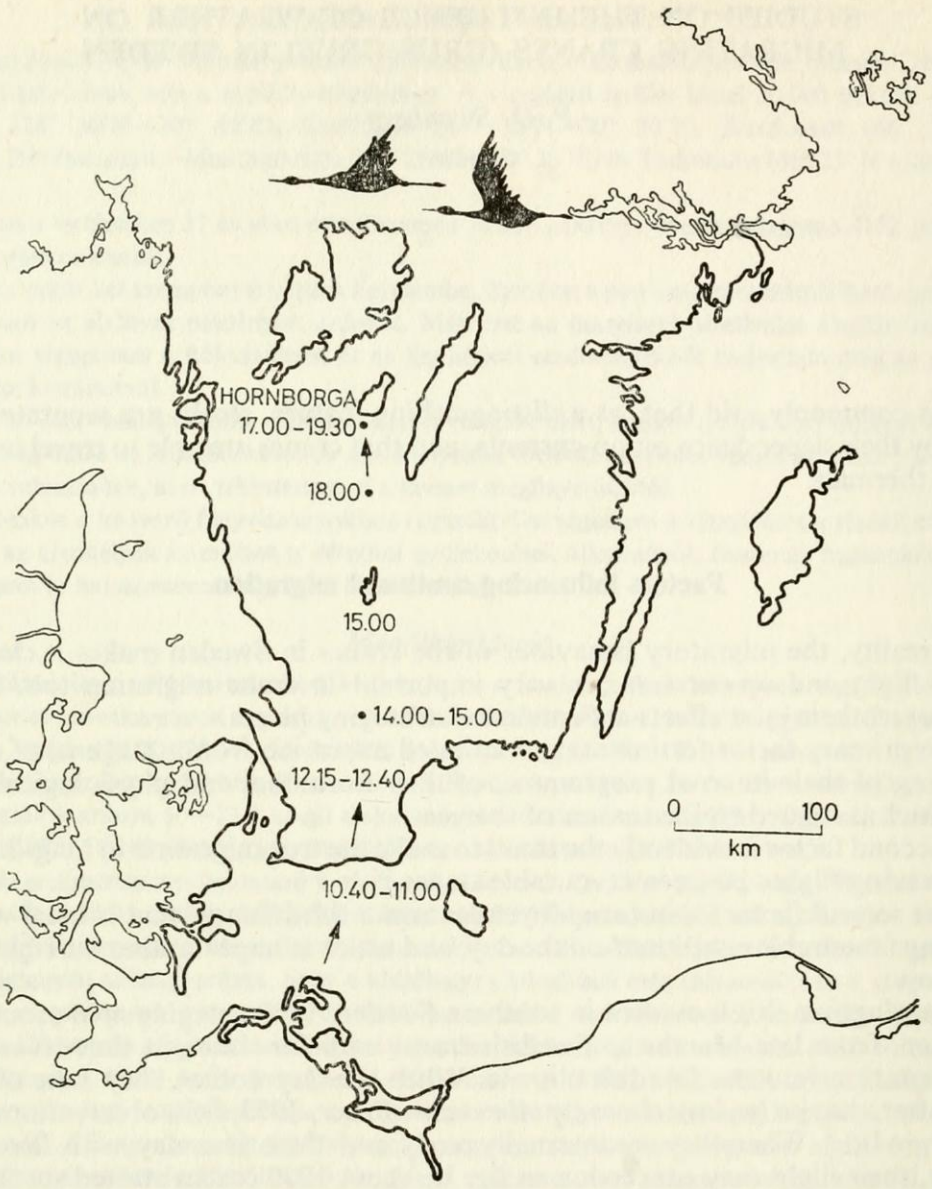


Figure 1. 19 April, 1969

It seems evident that if the cranes do not reach the day's pre-determined destination for a long-distance flight, they are able to go on during the next day or days to a certain degree independently of the weather, in order to reach their stage.

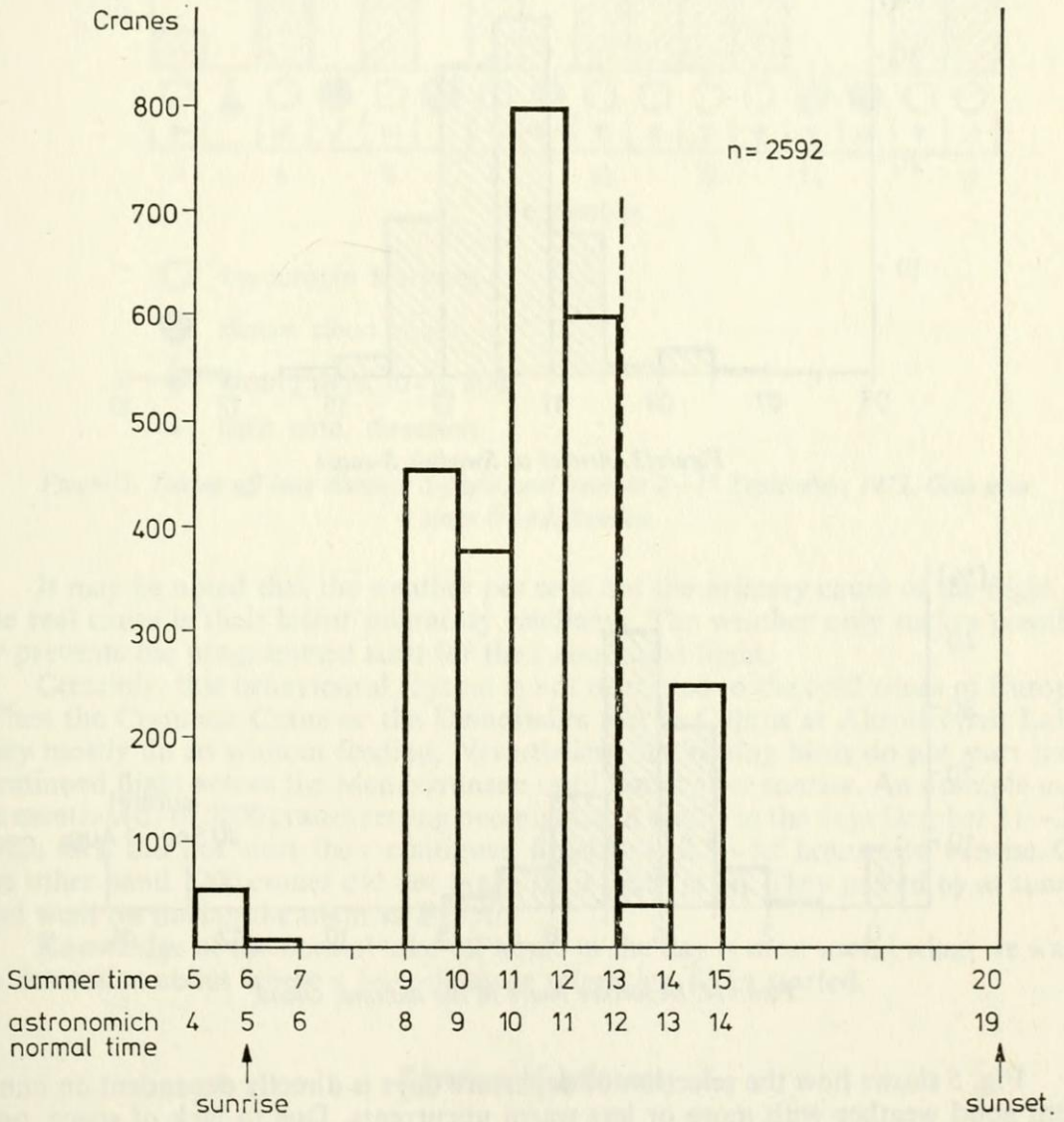
Take-off time for long-distance flight

The basic tendency to travel in long-distance flights using energy-saving thermals is indicated in fig. 2. The graph shows take-off hours for all the cranes of one of the two groups at Hornborga throughout April, 1983, when we kept daily continuous watch. It shows that the cranes normally do not start a long-distance flight

to another stage until about 3 hours after sunrise, when (and if) the air temperature begins to rise. The thick broken line drawn at noon reminds us of the fact that take-off only takes place at certain hours, seldom after noon—this is certainly for the reason that a later start is unfavourable for a long-distance migration flight.

Exceptions may be found, as indicated in the lower left-hand corner of the graph. Sometimes cranes delayed by the weather, after a long stay reach such a state of physiological readiness that they do not make their usual first morning flight to the feeding fields. Instead, they take off directly from the roost to the north as early as before or at sunrise.

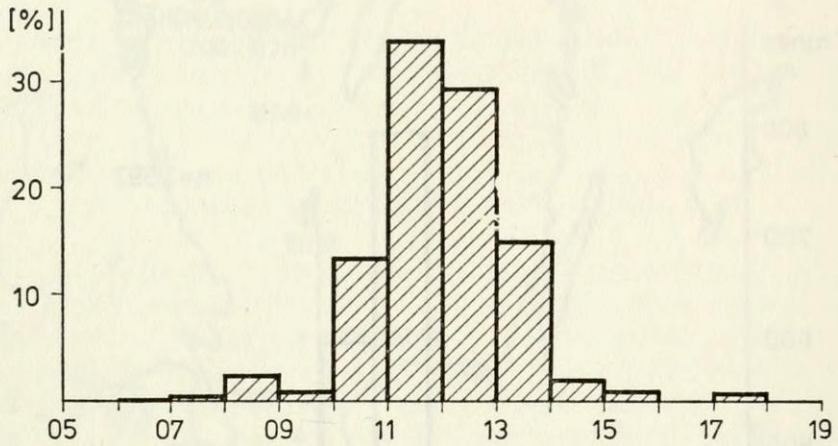
Sometimes, but rarely, serious disturbances in good weather can cause their departure some hours after noon.



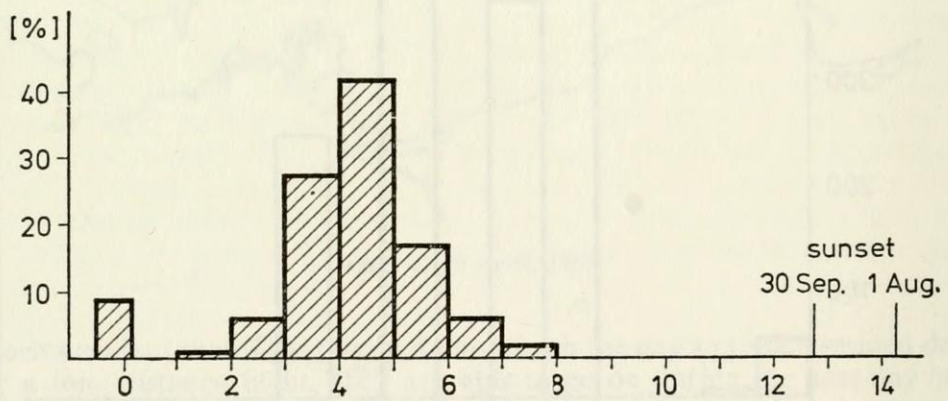
Figure/2. Normal time of day for starting continued migration from the stage at Hornborgasjön, 9—16 April, 1983. As time for sunrise and sunset is used the median time between 9th and 26th April

Of course we find the same daily rhythm of the flights from the Rügen area south of the Baltic to the southern Swedish coast. Fig. 3 is a compilation of times for 10 700 cranes noted in 186 reports during 10 years. It confirms indirectly that only very few cranes had started their flight from the Rügen stage before 08.00. Almost all cranes had started between 08.00 and noon.

From the island of Öland, the cranes have 3—4 times as great distance to cover to the land south of the Baltic as from the mainland. Nevertheless, in the autumn they show the same departure rhythm as in the spring on the mainland. This is obviously a way to enable them to fly in energy-saving weather (fig. 4). In fact, the final stage flight distance is equivalent to that in the spring, i. e. 450—500 km.



Figure/3. Arrivel to Swedish S-coast



Figure/4. Departure hours in the autumn, Õland

Fig. 5 shows how the selection of departure days is directly dependent on imminent good weather with more or less warm upcurrents. Due to lack of space, only the period in September, 1973, is included. However, the pattern in other years, and in the spring as well as in the autumn, coincides with the picture conveyed by this graph.

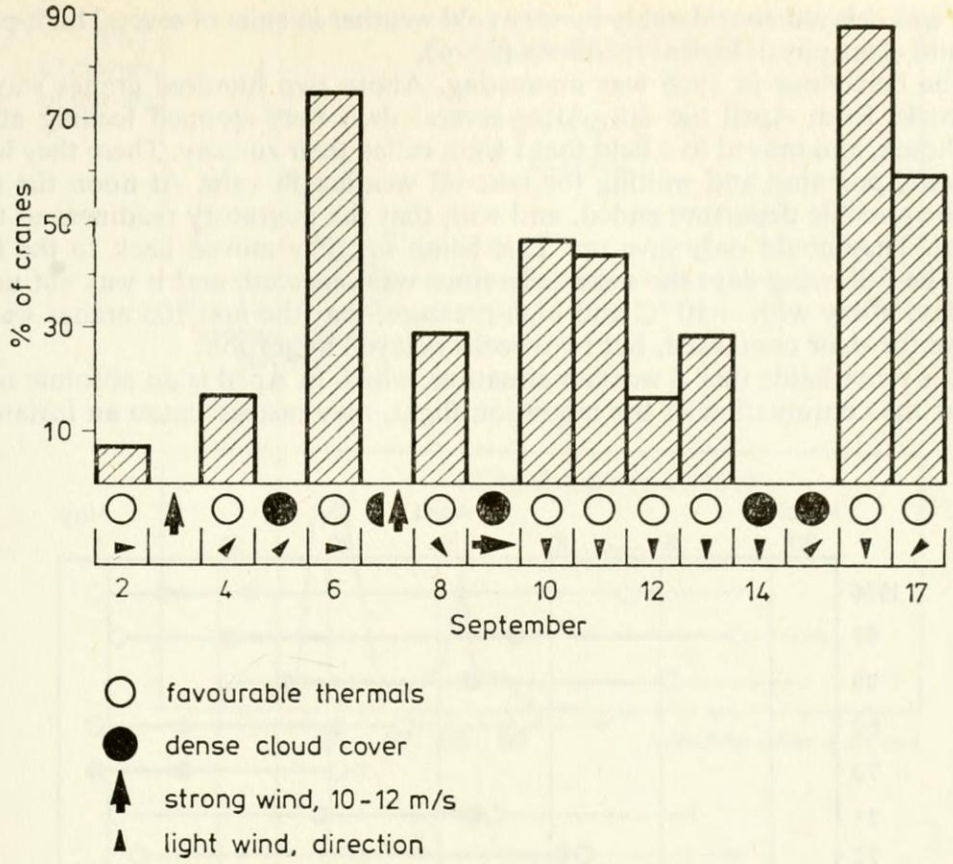


Figure 5. Taking off long distance S-flight, and weather 2—17 September, 1973. Grus grus stage Öland, Sweden

It may be noted that the weather per se is not the primary cause of the flight — the real cause is their latent migratory readiness. The weather only makes possible or prevents the programmed start for their continued flight.

Certainly, this behavioural rhythm is not restricted to the cold zones of Europe. When the Common Crane or the Demoiselles rest in Cyprus at Akrotiri Salt Lake, they mostly do so without feeding. Nevertheless, the resting birds do not start their continued flight across the Mediterranean until hours after sunrise. An example may be mentioned: of 3000 cranes resting overnight at Akrotiri in the days October 21—29, 1983, 96% did not start their continued flight until 2.5—3.5 hours after sunrise. On the other hand 1200 cranes did not break their flight at all. They passed by at sunset and went on during the night to Egypt.

Knowledge of the normal take-off hours in the day is most useful when we want to determine about where a long-distance migration flight started.

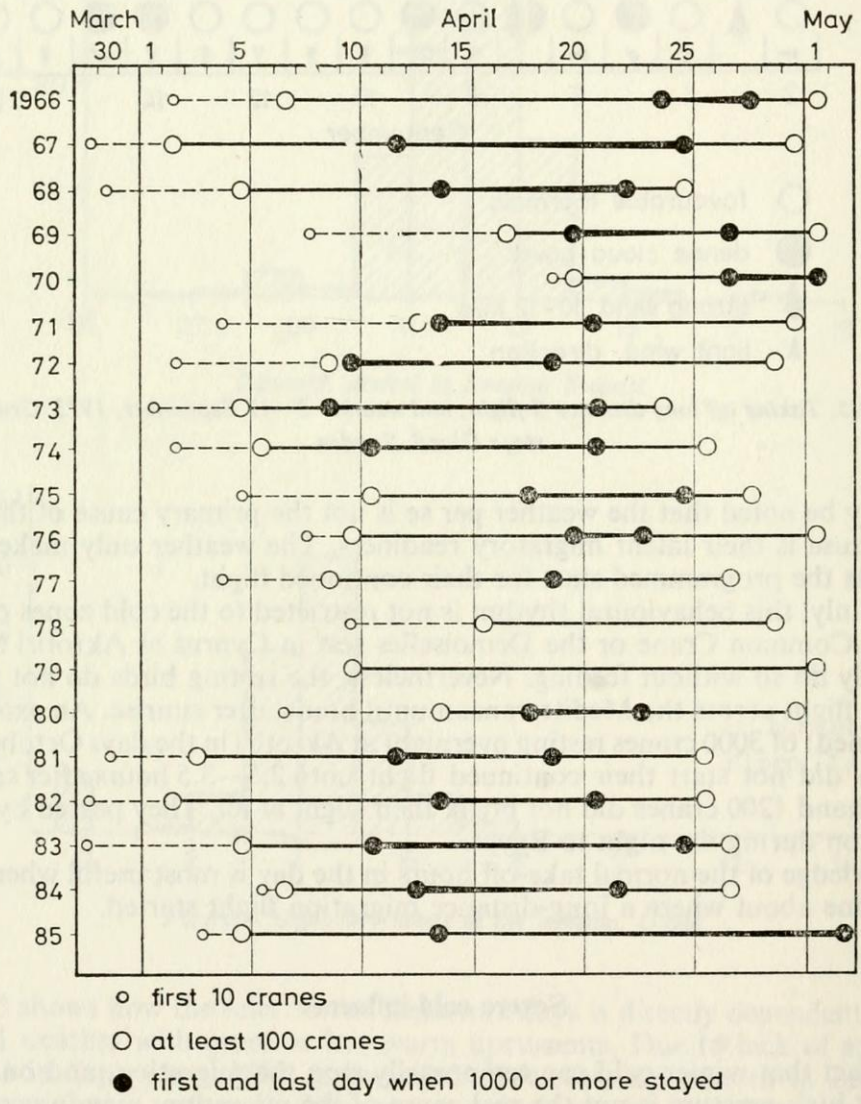
Severe cold influence

The fact that winter cold can temporarily stop the migration, and on the other hand, that high-pressure is not the real cause of the migration, may in certain years be well studied at the Hornborga stage. For example, in 1966 and 1970 spring mig-

ration was delayed considerably by very cold weather in spite of several high-pressure days and clear physiological readiness (fig. 6).

The behaviour in 1966 was interesting. About two hundred cranes stayed for two weeks from April the 5th. After several days they stopped feeding at about 09.00 hours, and moved to a field that I soon called their runway. There they lingered for hours, preening and waiting for take-off weather in vain. At noon the normal time for possible departure ended, and with that the migratory readiness of the day expired. They could only give up. This being so, they moved back to the feeding field. The following days the same behaviour was repeated, and it was not until the 15th day, a day with +10 °C and high-pressure, that the first 105 cranes were able to leave for their continued, but two-weeks delayed migration.

It is remarkable that a weather situation, which in April is an absolute obstacle to their the continuation of the migration flight, may instead cause an instant take-



Figure/6. Cranes at the stage Hornborgasjön, Sweden, 58°17′ N

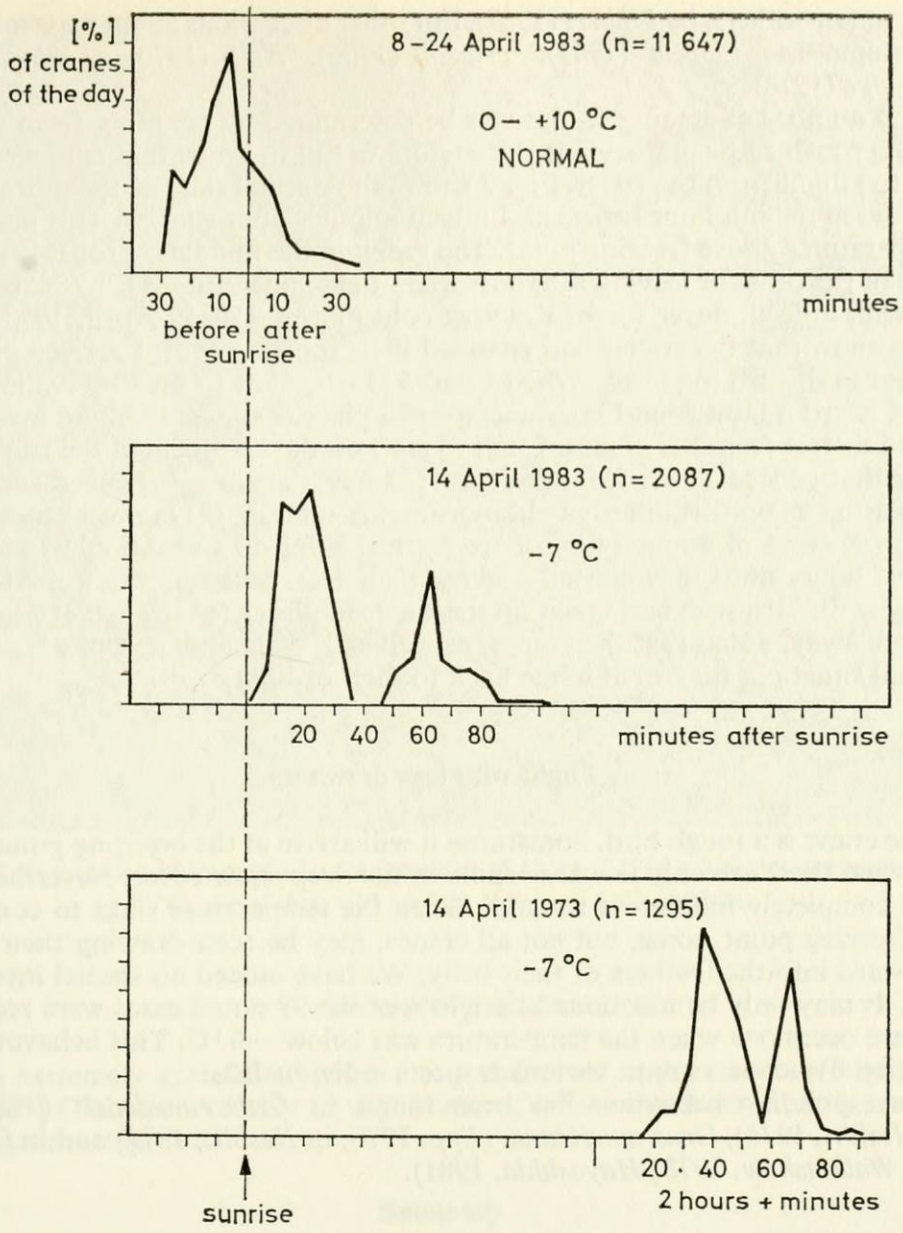


Figure 7. Grus grus. Departure from the roost to the feeding fields in April. Normal time and frost-related exceptions. Take-off per 5 minutes expressed in per cent of the day's number of roosting cranes

off in October. This is exemplified by the graph in fig. 4. In September 1968, 4000 cranes gradually left the stage on Öland, evidently all during the normal hours of the day, i. e. several hours after sunrise. The temperature dropped extremely rapidly in the night between 4 and 5 October, and in the morning the cranes found an ice crust around their feet. They began taking off half an hour before sunrise. In the next hour 700 cranes passed me in one long, magnificent line, heading southwest. Only 21 were left on the island. Such a sudden departure directly from the roost in the early morning in the autumn has been mentioned many times, and was discus-

sed by, among others, by *Libbert* (1957). For other discussions about mass migration in the autumn see *Libbert* (1961), *Prange* (1966), *Keil* (1970), *Schindler* (1972) and *Deppe* (1978).

The number of staging cranes can be determined by counting them when they leave the roost. In Scandinavia it is therefore useful to know that cold weather may retard the flight from the roost. Fig. 7 shows the normal time of the morning flight, i. e. between half an hour before and fifteen minutes after sunrise. This may be valid at temperatures above freezing point. The graph in the middle is probably a common picture of the time for leaving the roost when the temperature is 6—7 °C below zero.

I will, indeed, never forget the very cold morning of 12 April, 1973 (fig. 7). I did not know that the cranes had changed their roosting spot. I arrived in the dark so as not to disturb the birds. When I had 30 metres left to my observation place, a tower, I heard a faint sound in an unexpected place. I suddenly found myself only a hundred metres from the cranes. I had to stop on the spot behind the snow covered willows that concealed me from the cranes. I never again experienced such a dense congregation as on this bitterly cold morning. A total of 1217 cranes stood close together in a space of about 1400 square metres, I had to sit motionless in the snow for three hours until they started moving their feet, breaking the ice. At the same time my assistants, who had taken up their agreed places for the actual counting one kilometre away, noted that the cranes, as well as I, were absent. Unaware of the exceptional situation, they went home back to their ordinary work.

Flight with legs drawn up

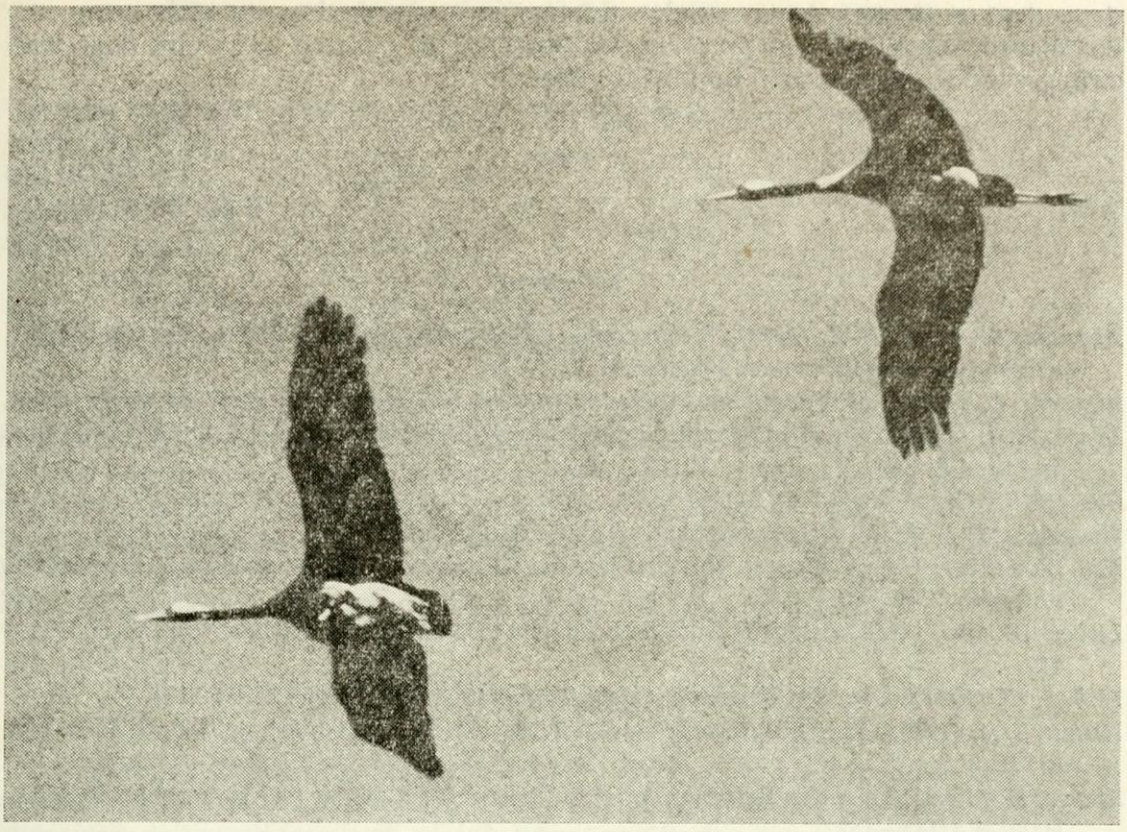
The crane is a tough bird. Sometimes it will arrive at the breeding grounds in the north when there are only few bare spots in the deep snow cover. Nevertheless, they are not completely indifferent to cold. When the temperature sinks to considerably below freezing point, some, but not all cranes, may be seen drawing their legs and feet forward into the feathers of their belly. We have indeed no special investigation of this. It may only be mentioned that 70% of the 99 noted cases were recorded on those rare occasions when the temperature was below −6 °C. This behavour is individual (fig. 8)—cranes are in various respects individualists.

Corresponding behaviour has been found in *Grus canadensis* (*Walkinshaw,* 1953; *Nesbitt,* 1978), *Grus americana,* (*Epp,* 1970, in *Nesbitt,* 1978) and in *Grus japonensis* (*Walkinshaw,* 1973; *Hayashida,* 1981).

Night migration

It is worth noting that night migration is rarely observed in Sweden. When it is observed, it is certainly a consequence of their tendency to make long-distance migration flights to a pre-determined stage. When the birds have not been able to reach their destination before dark, they can go on during the night for very great distances. This hypothesis has been mentioned many times since it was put forward by Professor *Sundevall* (1856) 130 years ago.

Lastly, it may be noted that wind drift is commonly found in Sweden, successfully studied with radar by *Alerstam* (1973, 1976. Field observations confirm that indeed wind drift is well compensated for by landmarks, and no lasting effect has been found.



Figure/8. Two cranes, photographed on the morning of 13 April 1974, when the temperature was —10 °C, one of them with its legs drawn up. Leif Arvidson

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I am extremely grateful to great many dedicated and patient members of the Skövde Bird Club, particularly to *Alf Karlsson,* who have worked with me during this 20-year investigation.

Summary

It is commonly said that the crane is distinguished from the storks by its ability to travel independent of upcurrent air. Indeed, when starting *long distance* flights from a stage the cranes in Sweden clearly are anxious to watch the opportunity of using thermals for energy saving flight, and to avoid days with unfavourable weather. This strongly influences the migration behaviour. Knowledge of their preferred rhythm, correlated to the weather, is useful when collecting field notes for investigation in Scandinavia. Migration flight in the night is rare in Sweden, may be thanks to abundance of more or less suitable resting places. In springtime, temperature below the freezing point and absence of thermals may delay start from the stage at Lake Hornborga (between 57 and 58 °N) until two weeks. In the autumn equivalent weather may release instant mass departure from a stage in early October. In springtime in Sweden, it may be important to know that time for leaving the roost may be in a way

dependent on the temperature. Below the freezing point the leaving of the roost may be delayed. Wind drift may influence, temporarily, the passage in certain days with strong wind. It gives indeed no lasting effect.

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Az időjárás hatása a darvak (Grus grus) vonulására Svédországban

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Svédország

Gyakran állítják, hogy a darvak abban is különböznek a gólyáktól, hogy felszálló légáramlatoktól függetlenül is képesek vonulni. Valójában *hosszú távolságok* megtétele esetében a svédországi pihenőhelyekről felszálló darvak igyekeznek kihasználni a meleg felszálló légáramlatokat és a kedvezőtlen időjárási viszonyokat elkerülik. Ez erősen hat a vonulási viselkedésre. A preferált, időjáráshoz kapcsolódó vonulási ritmus ismerete hasznos, amennyiben terepmegfigyeléseket akarunk gyűjteni Skandináviában. A darvak éjszaka ritkán vonulnak Svédországban, ami valószínűleg a többékevésbé megfelelő pihenőhelyek nagy számának köszönhető. Tavasszal, a fagypont alatti hőmérséklet és a felszálló légáramlatok hiánya akár két hétig is késleltetheti a Hornborga-tó (57 és 58 °N között) körül pihenő darvakat. Ősszel, kora októberben a hasonló időjárási viszonyok a darvakat tömeges, egyidejű távozásra kényszeríti. Fontos tudni, hogy Svédországban tavasszal a szálláshely elhagyása valamilyen módon a hőmérséklet függvénye, fagypont alatt késlekedik a távozás. Egyes szeles napokon a szél sodrása ideiglenesen módosíthatja a vonulás útvonalát, de ennek nincs maradandó hatása a vonulásra.