*Die Vogelwarte 28, 1975: 2–17*

# Redwing *(Turdus iliacus)* migration towards southeast over southern Sweden

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## 1. Introduction

Several radar studies have dealt with the Redwing *Turdus iliacus* and Fieldfare *Turdus pilaris* migration during October and November in northwestern Europe. Cases of SE/SSE-migration of Icelandic Redwings over the Outer Hebrides were described by LEE (1963), and of SSW/WSW-migration of Scandinavian Redwings and Fieldfares over the southern North and Norwegian Seas by LACK (1963) and MYRES (1964), respectively. The Scandinavian thrushes reoriented towards SE/SSE at dawn over the open sea. Heavy nocturnal passerine migration, almost certainly to a large extent involving thrushes, over southern Sweden during October towards both SSW/SW and SE/SSE was described by ALERSTAM et al. (1973).

In the course of a radar study of the bird migration during October and November 1972 and 1973, Redwings and, possibly, Fieldfares were regularly found to be travelling during day-time towards SE/SSE over southern Sweden. This unexpected finding is the subject of the present report.

## 2. Methods

The principal radar station, situated in southern Skåne, was a high-power L-band radar, the PPI of which was filmed with time-lapse technique (2.5 frames/min). Southeastward migration over the study area (Fig. 1) from 06.00 to 15.00 hrs was analysed from 15. Sept. to 16. Nov. 1972 and 1973. No radar data were available from 27. Sept., 17. Oct., 2. and 13. Nov. 1973. On a few days complementary data were obtained from other radar stations in Skåne and Blekinge.

Since departures from Skåne over the Baltic Sea usually were concentrated to the Sandhammaren area (Fig. 1), flight directions and speeds were measured over the open sea off this area. Ground speeds were assessed by tracing individual echoes over at least 20 kilometers (usually 30–40 km) and reading the time to the closest full minute. Daily mean ground speeds were calculated from 10–20 such measurements. The daily mean direction was fitted by eye on the basis of the plots of individual echo tracks on maps.

Wind direction and speed were estimated from ground synoptic maps (at 07.00 hrs), assuming wind direction to be parallel to the isobars and wind speed related to the air pressure gradient. These wind conditions normally prevail at about 500–1000 m altitude. Ground measurements of wind at Sandhammaren proved to be useless (producing highly variable and sometimes completely unrealistic air speeds of the birds). As the altitudes at which the birds migrated over the sea were unknown, inferences involving use of the wind data should be made with due care.

## 3. Identification

The identification of the radar echoes was primarily based on one day of obvious correlation between Redwing migration as recorded by field observations and by radar. The records of Redwing and Fieldfare migration from 23. Sept.–14. Oct. 1973

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[1]) Report No. 69 from Falsterbo Bird Station.

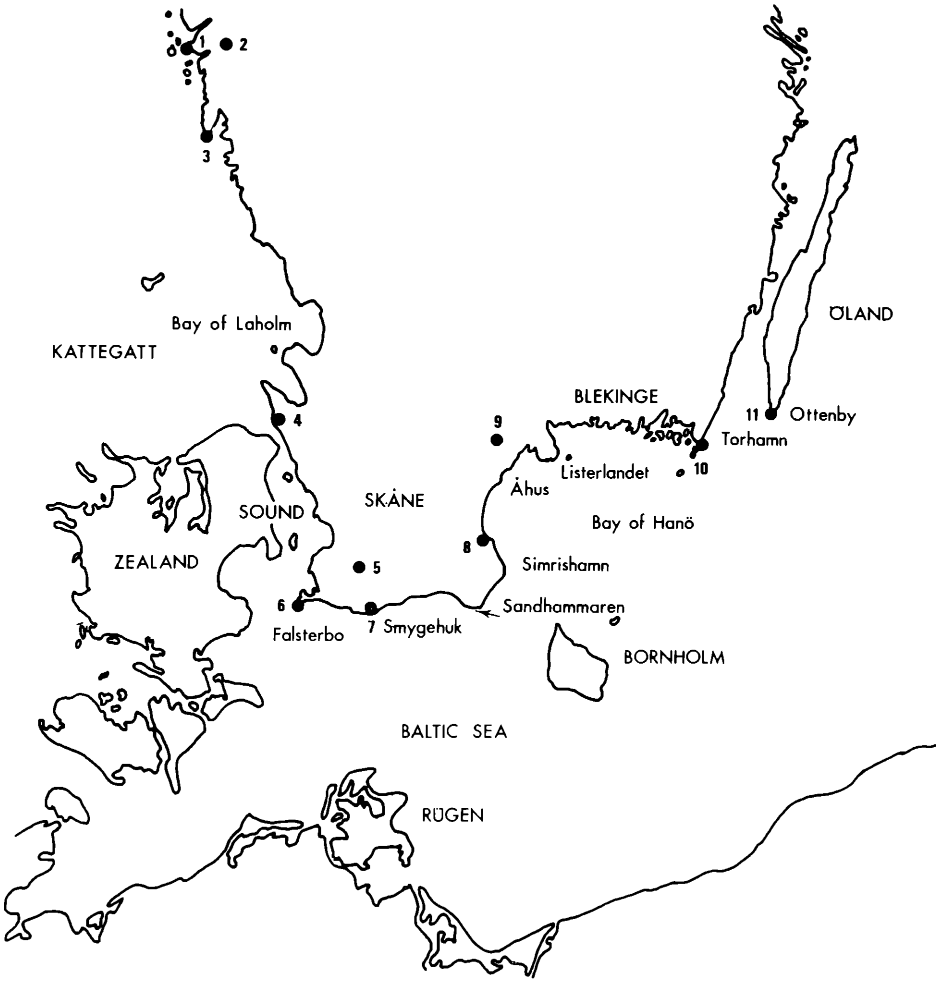



Fig. 1: Study area. Field observations were carried out at sites 1–11 during the autumn of 1973 (cf. Tables 1 and 2).

gathered by field observers at 11 sites (Fig. 1) are shown in Table 1. Further records 15. Oct.–15. Nov. 1973 at Falsterbo are given in Table 2. As seen from these tables, there was an outstanding occasion of thrush migration on 10. Oct. at site 8. With very hard (up to 20 m/s) westerly winds 125 000 Redwings were seen migrating south at very low altitudes along the east coast of Skåne. The movements started after rain had stopped at 07.45 hrs and was most intensive 08–10 hrs (cf. Fig. 6, p. 14), but still continued when observations were terminated at 14.00 hrs.

This time distribution of visible Redwing migration coincided exactly with that of the radar echo movements illustrated in Fig. 2B (p. 7). The movements consisted of distinct, dot-like, rather large echoes (not, however, as large as those from flocks of Wood Pigeons *Columba palumbus*), indicating that the birds migrated in flocks. As is to be expected from the low flight altitudes, practically no radar echoes were seen over land, but the birds apparently increased their altitude considerably over the sea

Table 1
Daily numbers (06.00–14.00 hrs) of migrating Redwings *Turdus iliacus* and Fieldfares *Turdus pilaris* at eleven observation sites (cf. Fig. 1.) 23. Sept.–14. Oct. 1973.

| | Approx. direction of migration | Sept. 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | Oct. 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Turdus iliacus* | | | | | | | | | | | | | | | | | | | | | | | | |
| Site 1 | S | | | | | | | | | 143 | | | | | | | | | | | | | | 143 |
| 2 | S | | | | | 5 | 12 | | | 80 | 1 | 49 | 11 | 22 | 1798 | 18 | | 2 | 794 | 694 | 48 | 59 | 115 | 3708 |
| 3 | S | | | | | | | | | | | | 5 | | 110 | | | | | 12 | 23 | | 8 | 158 |
| 4 | S | | | | | 10 | | | 3 | | 5 | | | | 5 | | | | | 41 | | | | 64 |
| 5 | S | | | | | | | | | 3 | | 3 | | | | 5 | | | | 15 | | 1 | | 27 |
| 6 | SW | | | | | | | | | | | | | | | | 29 | | 232 | 15 | | | | 276 |
| 7 | W | | | | | | | | | 2 | | | | | | | | | 789 | 4 | 1 | | 4 | 800 |
| 7 | E | | | | | | | | | | | | | | 1 | | | | | | | | 5 | 6 |
| 8 | S | | | | | | | | | | | | | | | | | | 125 768 | | | 103 | | 125 871 |
| 9 | SW | | | | | | 2 | 3 | | 2 | | | 54 | | 3 | | 20 | 4 | ²) | 59 | 33 | 109 | 64 | 353 |
| 10 | S | | | | | | | | | | | | 1 | | | | | | | | | 2 | | 3 |
| 11 | S | | | | | | | | | | | | | | | 1 | | | | | | | | 1 |
| *Turdus pilaris* | | | | | | | | | | | | | | | | | | | | | | | | |
| Site 2 | S | 3 | 16 | 11 | 1 | 2 | 2 | 1 | | 6 | | 8 | 42 | 1 | 14 | | 9 | 2 | 13 | 30 | 4 | 1 | 32 | 198 |
| 3 | S | 1 | | | | 38 | | 11 | | | | 225 | 51 | | 55 | | 33 | | | 260 | 245 | 87 | 483 | 1489 |
| 4 | S | | | | | | | | | | | | | | 1 | | | | | | | | 8 | 9 |
| 6 | SW | | | | | | | | | 5 | | | | | | | 5 | | | 7 | | | | 17 |
| 7 | W | | | | | | | | | 1 | | | | | | | 28 | | 30 | | 4 | 83 | | 146 |
| 8 | S | | | | | | | | | | | | | | | | | | 3 | | | 110 | | 113 |
| 9 | SW | | | | | 9 | 1 | 5 | | | | | 22 | | | | | | ²) | | 12 | 1 | 2 | 52 |
| *Turdus* sp. | | | | | | | | | | | | | | | | | | | | | | | | |
| Site 2 | S | | | 1 | | 91 | 15 | | | | | | | | | | 11 | 32 | 237 | 162 | 47 | 107 | 36 | 739 |
| 7 | W | | | | | 3 | | | 4 | | | | | | | | 10 | | 869 | 6 | 41 | 82 | 26 | 1044 |
| 8 | S | | | | | | | | | | | | 13 | | | | | | | | | 241 | | 254 |

²) observations only 11.00–14.00 hrs.

Table 2
Daily numbers (06.00–14.00 hrs) of migrating Redwings *Turdus iliacus* and Fieldfares *Turdus pilaris* at Falsterbo (site 6, cf. Table 1) 15. Oct.–15. Nov. 1973.

| | October 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Turdus iliacus* | | | | | 1285 | 37 | | 15 | 72 | 7 | | | 335 | 2 | 2 |
| *Turdus pilaris* | | | 2 | 62 | 210 | 353 | | 361 | 279 | 9 | | 58 | 632 | 2 | 20 |

| | Oct. 30 | November 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *T. iliacus* | 23 | | | | | | | | | | | | | | | |
| *T. pilaris* | 432 | 73 | | | | | | 18 | 50 | | 81 | | 105 | | 264 | 15 |

and therefore became clearly visible on the radar PPI. No other important movements of radar echoes were seen on this day.

Beyond any reasonable doubt Redwing migration produced the radar echo pattern observed. Similar movements of low magnitude were recorded on the radar on three other days with simultaneous field observations at site 8, i. e. 2., 8. and 13. Oct. 1973 (cf. Table 3). No thrush migration was noted by the field observer on the first and second occasion, while 450 thrushes (103 Redwings, 110 Fieldfares and 241 un-

Table 3
Migration from Skåne towards southeast 15. September–16. November 1972 and 1973 at 06.00–15.00 hrs.

| Year | Date | Intensity of migration | Track direction | Heading direction | Ground speed ± s. e. (km/h) | True air speed (km/h) | Wind direction | Wind force (km/h) |
|---|---|---|---|---|---|---|---|---|
| 1972 | 12. Oct. | moderate | 162° | 169° | 81.6 ± 1.7 | 44 | 334° | 38 |
| | 17 Oct. | moderate | 149° | 174° | 74.9 ± 2.0 | 47 | 297° | 38 |
| | 20. Oct. | low | – | – | – | – | 307° | 38 |
| | 24. Oct. | high | 145° | 225° | 99.4 ± 1.5 | 45 | 299° | 102 |
| | 25. Oct. | low | – | – | – | – | 286° | 46 |
| | 2. Nov. | high | 151° | 176° | 97.1 ± 2.1 | 43 | 314° | 61 |
| | 4. Nov. | moderate | 144° | 162° | 69.2 ± 1.7 | 36 | 305° | 35[4]) |
| 1973 | 2. Oct. | low | 142° | – | – | – | 278° | 63 |
| | 8. Oct. | moderate | 152° | 162° | 80.0 ± 2.1 | 55 | 312° | 28 |
| | 10. Oct. | high | 134° | 191° | 87.7 ± 2.3 | 59 | 272° [5]) | 74 |
| | 13. Oct. | low | 144° | – | – | – | C. 250° | C. 20 |
| | 16. Oct. | moderate | 143° | 126° | 54.8 ± 1.2 | 41 | C. 360° | C. 20 |
| | 18. Oct. | high | 139° | 185° | 63.5 ± 2.3 | 40 | 280° | 46 |
| | 29. Oct. | moderate | 148° | 148° | 85.3 ± 2.5 | 50 | 328° | 35 |
| | | Mean ± s. e. | 146° ± 2 (N = 12) | 172° ± 8 (N = 10) | 79.4 ± 4.5 (N = 10) | 46.0 ± 2.2 (N = 10) | 302° ± 8 (N = 14) | |

Notes
[3]) Low magnitude approximately compares to less than 100 radar echoes departing from Skåne, moderate magnitude to 100–1000 echoes and high magnitude to more than 1000 echoes.
[4]) Wind force decreased during the morning.
[5]) Wind direction shifted towards WNW during the morning.

identified thrushes, cf. Table 1) flew south along the coast on 13. Oct. Departures were, however, particularly concentrated to Sandhammaren on 2. and 8. Oct. On 10 further days (cf. Table 3), when no field observations were available for comparisons, southeastward movements by the same type of echoes and of a very similar pattern as on 10. Oct. 1973 took place. It may be assumed that thrushes were responsible for all these movements.

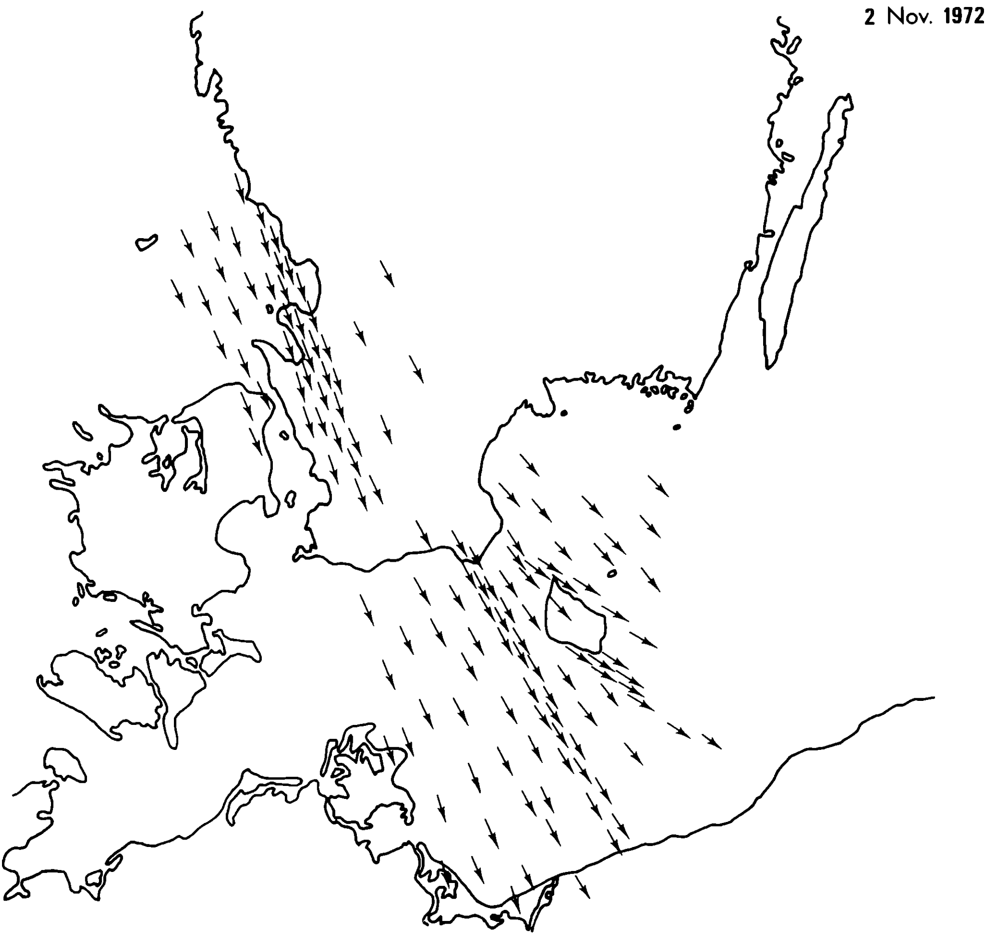
Further support is provided by the calculated true air speed, 46 km/h (Table 3), which is according to expectation for birds of this size (Pennycuick 1969).

Thus, the Redwing is demonstrated with certainty to be involved, but it is also possible that the Fieldfare made up at least part of the movements on some days (e. g. 13. Oct. 1973). The Fieldfare is discussed alongside with the Redwing in this paper, although there is no clear evidence of its participation in the movements described.

**4. Magnitude, speed and pattern of migration**

Data on the magnitude, direction and speed of the southeastward migration are compiled in Table 3.

The southeastward migration during the morning was witnessed on 14 days during the autumns of 1972 and 1973. Very intensive migration occurred on two



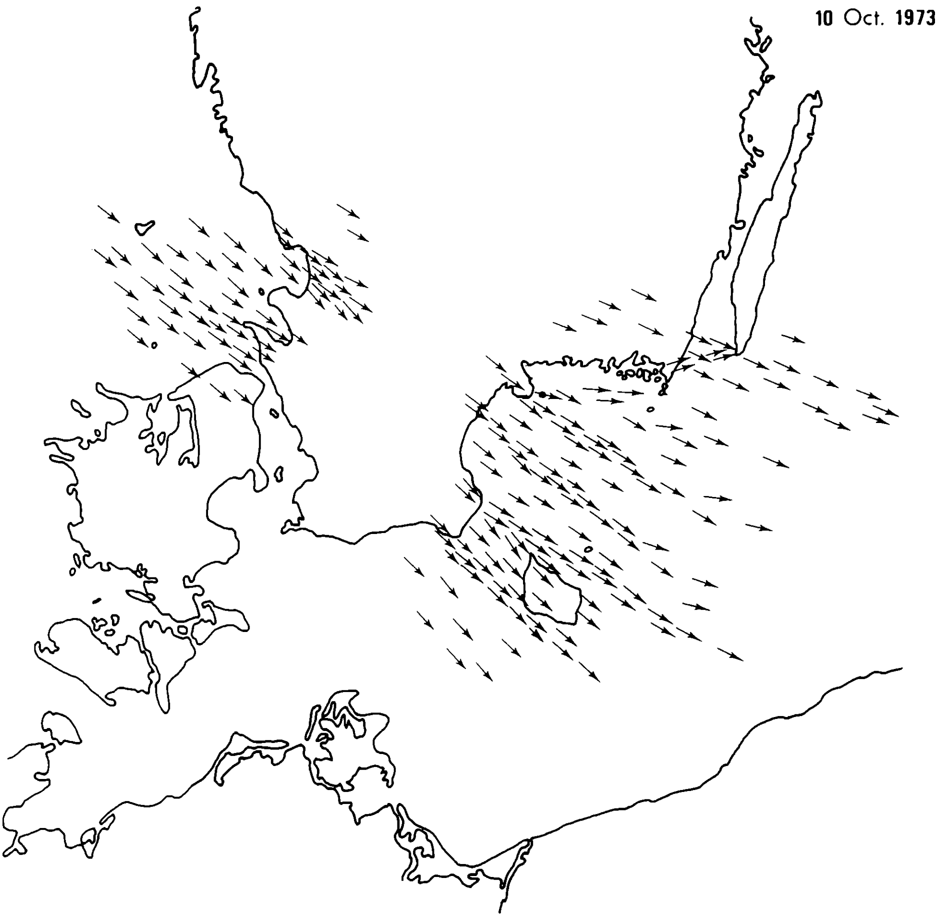



Fig. 2: Geographical pattern of Redwing (and possibly Fieldfare) migration on 2. Nov. 1972 (A) and 10. Oct. 1973 (B) as seen on the radar.

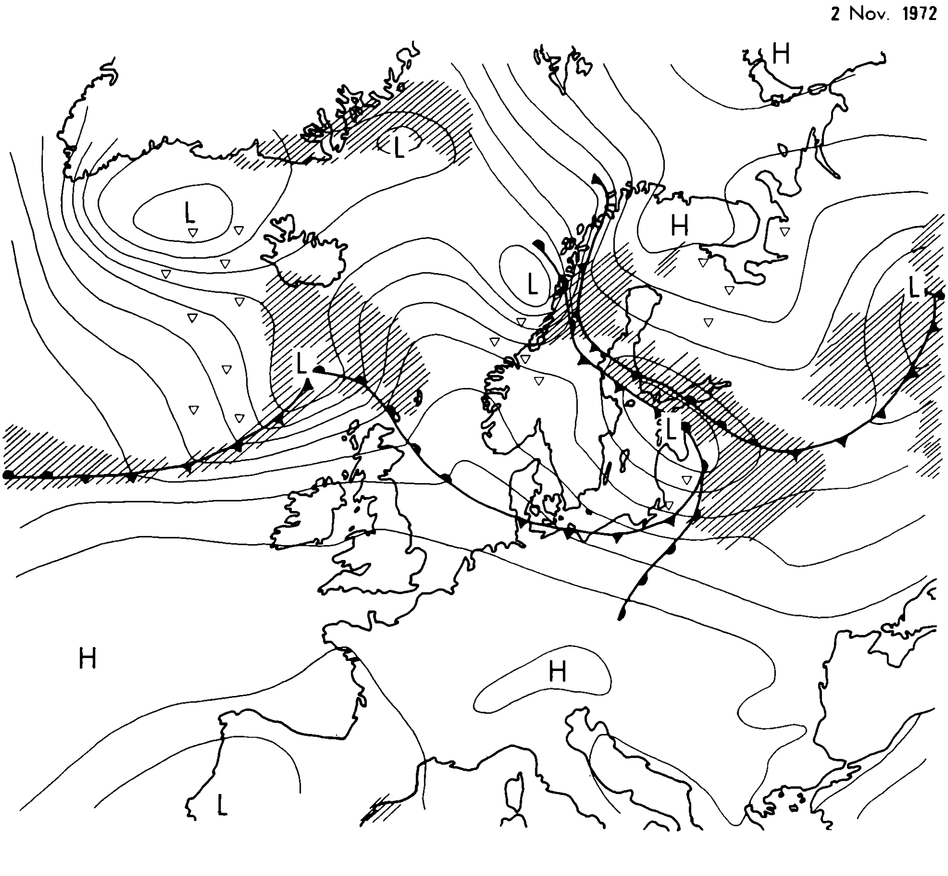
days each autumn. No comparable movements towards southwest, or any other direction, were noted, excluding the highly distinctive Wood Pigeon migration (ALERSTAM & ULFSTRAND 1974).

The birds migrated with a considerable tailwind and ground speeds ranged from 55 to 99 km/h (Table 3). The ground speed was on average 79 km/h, thus exceeding the air speed by 73 %.

The geographical pattern is exemplified in Fig. 2. The movements were heavily influenced by leading lines. On 2. Nov. 1972 (Fig. 2A) concentrated departures over the Baltic Sea took place from 1. the southeasternmost corner of the island of Bornholm at about 07.00 hrs. in the early morning, 2. the area at Simrishamn and 3. Sandhammaren. Departures were particularly intensive at the latter site and considerable migration was still recorded at noon. Concentrated movements were also seen over the Bay of Laholm, apparently arriving along the west coast, continuing over northwestern Skåne. On 10. Oct. 1973 (Fig. 2B) concentrated departures over the sea from five distinct areas were discerned, viz. 1. southeastern Blekinge (rather sparse migration), 2. the peninsula of Listerlandet, 3. the area at Åhus, 4. at Simrisham and 5.

Sandhammaren. The directions of migration were slightly different at these five areas. Mean direction for departures from Listerlandet was 122°, from Åhus 130° Departures at Simrisham initially took place towards about 120°, but the mean direction shifted during the morning to that of the migration from Sandhammaren, i. e. 134° (Table 3). A heavy influx over land was recorded from the Bay of Laholm at the west coast.

The movements usually started at around sunrise, showed a peak between 07 and 10 hrs. and were sparse at noon. On most days southeastward movements of similar echoes with similar speeds increased again about one hour before sunset, but migration now proceeded in a broadfront manner. About half an hour after sunset most distinct echoes seemed to disintegrate into diffuse echoes, which characterize nocturnal migration of passerines travelling singly rather than in flocks (cf. Gauthreaux 1972). Hence, the occurrence of the movements described in this study was highly correlated to that of distinct echoes towards southeast immediately before and at sunset as well as to nocturnal southeastward movements of diffuse echoes. It is well known that Redwings to a large extent migrate during the night and it is quite likely that they make up an important part of the migration during the late afternoon as well as the night. The absence of leading line effects during the afternoon (and of course during the night) could be related to higher flight altitudes of the migrants as the radar echoes were seen over both land and sea. The nocturnal passerine migration will be analysed in a separate report.



10 Oct. 1973

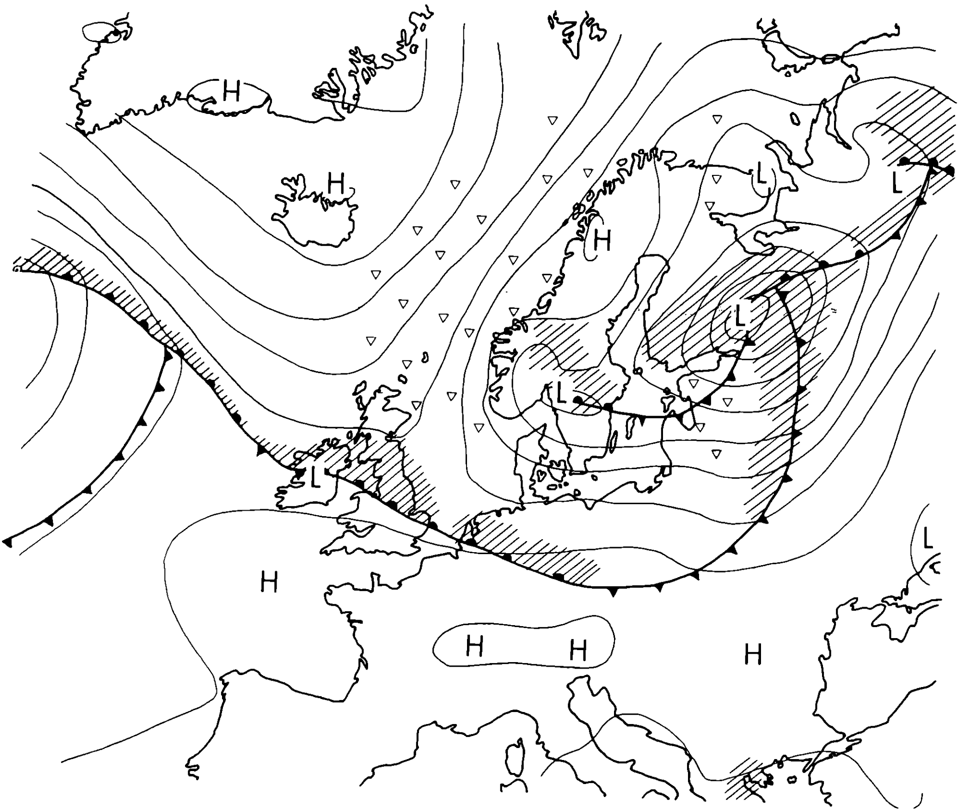



Fig. 3: Synoptical weather situation on 2. Nov. 1972 (A) and 10. Oct. 1973 at 07.00 hrs (06.00 hrs GMT).

### 5. Migration in relation to weather

The movements took place with the flow of WNW winds in the rear of a low pressure passing eastwards over central or northern Scandinavia. The synoptical weather situation is exemplified for 2. Nov. 1972 and 10. Oct. 1973 in Fig. 3.

As seen from Table 4 migration was recorded on 13 days out of 15 with winds blowing from between west and north during the period 2. Oct.—4. Nov. On one of the days with no migration in spite of WNW winds (19. Oct. 1972) rain during a front passage probably prevented migration, whereas no explanation could be given for the lack of migration with WNW winds on 26. Oct. 1973. Sparse migration was recorded on one day with WSW winds (13. Oct. 1973).

On 9 out of the 14 days with migration a cold front passage immediately preceded migration (cf. Fig. 3). Migratory activity usually was accompanied by decreasing (over the past 24 hours) air pressure (decreasing at Gothenburg on 11 and increasing on 3 days with migration) and cloud cover (decreasing at 8, no change at 2 and increasing at 4 instances). The movements were not related to temperature changes (increasing on 7 and decreasing on 7 days) nor temperature or air pressure in relation to normal (temperature was below normal on 6 days, normal on 2 days and above normal on 6 days, while air pressure was below and above normal on 7 days each).

Thus wind direction was probably of paramount importance for the migratory activity.

Table 4
Migration from Skåne towards southeast in relation to wind direction.
Days with extensiv rain are given in brackets.

| | Days with migration | Days without migration |
|---|---|---|
| NW winds (271°–360°) | | |
| Before migration period | | 2 |
| Migration period | 13 | 2 (1) |
| After migration period | | 13 |
| WSW winds (230°–270°) | | |
| Before migration period | | 2 (1) |
| Migration period | 1 | 11 (4) |
| After migration period | | 7 (1) |

Notes: Before migration period = 15. Sept.–1. Oct.
Migration period = 2. Oct.–4. Nov.
After migration period = 5. Nov.–16. Nov.

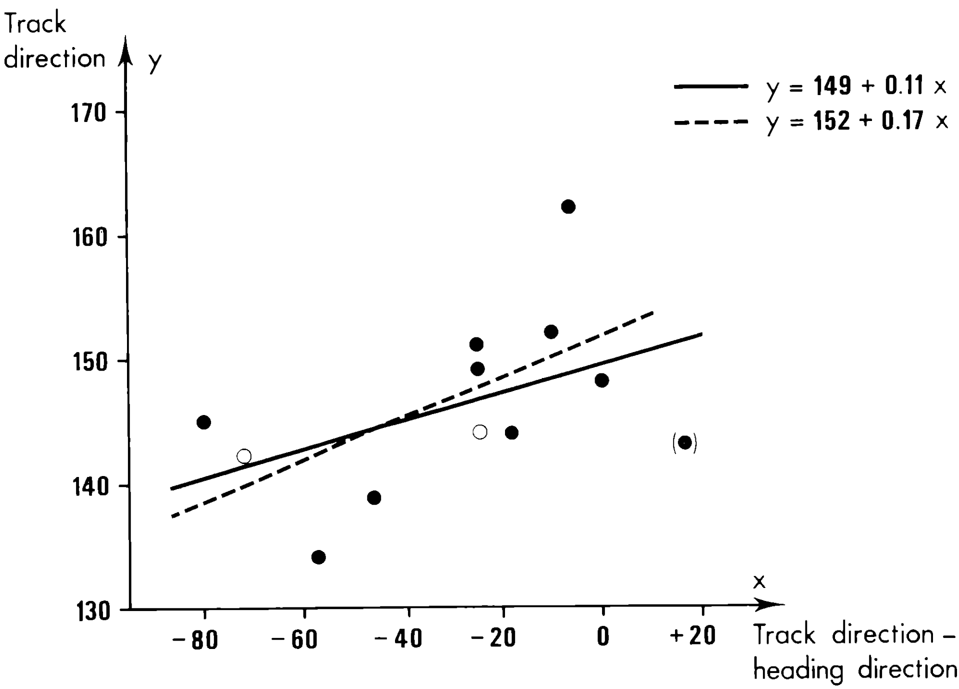



Fig. 4: Daily mean track direction (y) in relation to track direction minus heading direction (x). The direction for 16. Oct. 1972 is put in brackets and the linear least square fit is calculated including this day (solid line) and excluding it (broken line). On days with open circles ground speeds were not available and the x-values were calculated assuming an air speed of 46 km/h (cf. Table 3).

## 6. Flight directions in relation to wind

To investigate the influence of wind on track and heading directions, the mean track directions were plotted against the angle between track and heading directions (Fig. 4). This angle corresponds to the amount of compensation if the birds fly on fixed track directions and the amount of drift if they fly on fixed headings. Fixed track directions would result in the regression of Fig. 4 having a coefficient equal to 0, and a regression coefficient of 1 would imply fixed heading directions.

As seen from Fig. 4 the regression coefficient is 0.11 (± s. e. 0.07). The 95 %-confidence interval is ± 0.15 and the coefficient is thus statistically clearly separated from 1, but not from 0. Wind data were particularly uncertain for 16. Oct. 1973 (cf. Table 3); therefore one is justified to exclude this day. In that case the regression coefficient is 0.17 (± s. e. 0.07). This coefficient is still statistically different from 1 and barely so from 0 (95 %-confidence interval ± 0.16).

A SPEARMAN rank correlation test gives the same result. The positive correlation in Fig. 4 ($r_s = 0.44$) is not statistically significant ($p > 0.05$). After excluding the data from 16. Oct. 1973, however, the correlation ($r_s = 0.63$) is significant ($p < 0.05$).

It could be concluded that the birds do not fly on a fixed heading but adjust their heading direction so that compensation for wind drift is achieved. There is a tendency, however, that track direction to a minor degree is affected by wind. This effect may not necessarily be due to incomplete compensation for wind drift, but may be explained by the fact that populations with different preferred track directions migrate under different wind conditions (referred to as pseudo-drift by EVANS 1966, cf. also NISBET & DRURY 1967).

## 7. Migration goals

The thrushes obviously arrived from Norway and possibly to some extent from areas along the west coast of Sweden. Whether heavy southeastward migration of Redwings takes place further north in Scandinavia is not known, but the tendency of the movements to be most intensive at the southeasternmost corner of Skåne as well as the lack of records of appreciable Redwing migration at Ottenby (cf. Fig. 1) during ten autumns of field observations (EDELSTAM 1972) may indicate that no such migration occurs.

As mentioned in the introduction West Scandinavian thrushes are known to migrate also towards west of south over the Norwegian (MYRES 1964) and North Seas (LACK 1963, EVANS 1966). At least three alternative hypotheses of the pattern and mechanism of thrush migration, notably Redwing migration, from western Scandinavia may be suggested:

A: Part of the autumn population of West Scandinavian thrushes winters in regions situated in a southeasterly direction, and these birds are passing Skåne on tracks pointing towards this wintering area.

B: Part of the autumn population of the West Scandinavian thrushes initially migrates on preferred tracks towards SE/SSE and later changes their tracks in order to reach their winter quarters in western and southern Europe. Another part of the population migrates towards SSW/WSW

C: The Redwings select between preferred track directions towards SSW/SW or SE/SSE in relation to wind conditions.

A: This hypothesis predicts that winterquarters of Redwings (and Fieldfares) from Scandinavia are to be found in the sector 120° to 162° (extreme track directions on 10. Oct. 1973 and 12. Oct. 1972) as shown in Fig. 5.

The bulk of ringing recoveries (about 95 %) of Scandinavian Redwings and Fieldfares is, however, found in western and southern Europe and only two recoveries of Redwings ringed in Norway and none ringed in Sweden are found in this sector (Fig. 5). One recovery of a Fieldfare ringed in Norway and three from Sweden are from this sector. Two of the Swedish Fieldfares were recovered during their first winter. The other Redwing and Fieldfare recoveries were made during the second or third winters and one Redwing ringed in Norway was reported from Libanon after five years.

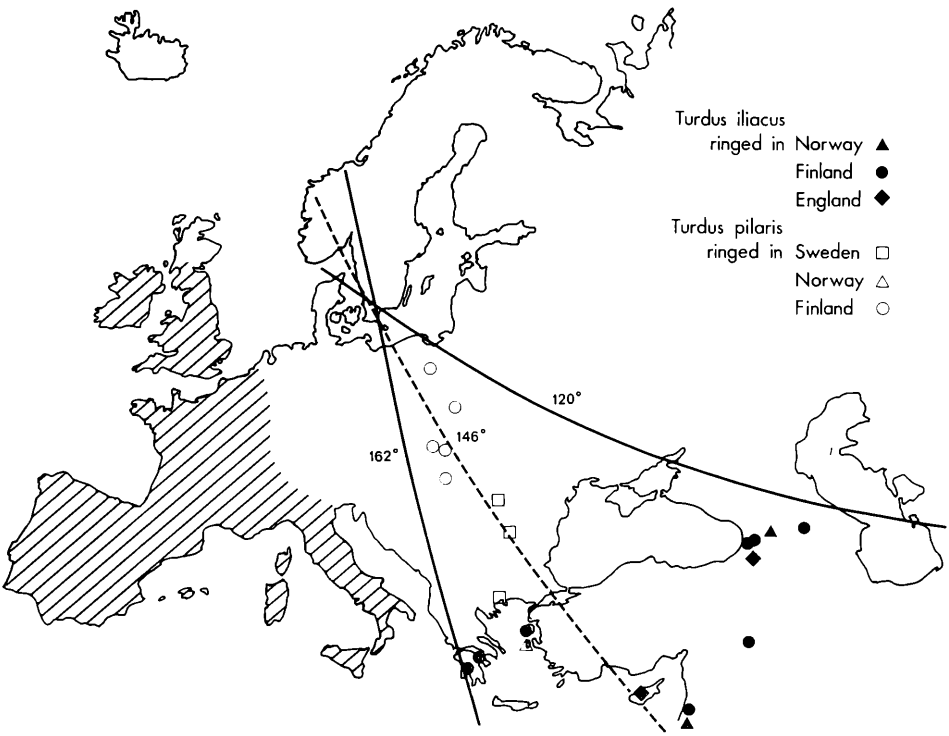



Fig. 5: Ringing recoveries of Redwings and Fieldfares in the sector 120° to 162° from the study area. The mean track direction of departures from Skåne (146°) is shown by the broken line. The main winter quarters (about 95 % of all ringing recoveries) of Fennoscandian Redwings and Fieldfares are hatched. The figure is based on data from Ashmole (1962), Nordström (1963), Mork (1974) and the yearly reports by S. Österlöf, Swedish Museum of Natural History 1960–64.

The recoveries of Redwings and Fieldfares ringed in Finland generally are from the same west European countries as those from Norway and Sweden, but five Fieldfares and eight Redwings were recovered in the sector shown in Fig. 5.

Two birds, ringed during the winter in England, were recovered in a later winter in Cyprus and Russia.

The areas in the sector shown in Fig. 5 are regular winter quarters for easterly populations of Redwings and Fieldfares (Ashmole 1962). Several ringing recoveries show that thrushes arrive to Scandinavia from the east during the autumn. Redwings from Sweden, Finland and the Sovjet Union have been recorded in Norway during the autumn. One bird was ringed as a nestling at Tomsk in Sibiria during May and recovered in Norway during October the same year (Mork 1974). Thus, the southeastward movements in southern Sweden may be composed of populations breeding east of Scandinavia, which initially have migrated towards the west and in Scandinavia have adopted southeasterly preferred track directions towards their winter quarters. Several Fennoscandian thrushes recovered in areas towards the southeast were, however, ringed as nestlings. Furthermore it seems that the geographical distribution of recoveries from thrushes ringed during the autumn migration in Scandinavia is similar to that of recoveries from birds ringed as nestlings (Ashmole 1962, Mork 1974).

Thus ringing data indicate that Fieldfares and particularly Redwings from Fennoscandia sometimes may winter in areas towards the southeast. The data, however, lend no convincing support to the idea that considerable numbers of West Scandinavian thrushes regularly migrate to these wintering areas.

B: According to this hypothesis different parts of the thrush population in western Scandinavia use different migratory routes, one of them constituting initial southeastward migration and later reorientation towards southwest. The change of preferred tracks may be gradual, as described for the Chaffinch *Fringilla coelebs* by PERDECK (1970), or may occur drastically after the migrants have travelled for a certain time or distance (cf. the concept of goal migration as discussed by RABØL 1970).

Radar studies have revealed that nocturnal passerine migrants leave Britain on preferred track directions to the east of south (LACK 1963, EVANS 1966, PARSLOW 1969). It is believed that the migrants change their track direction towards SSW somewhere in France and proceed to the Iberian peninsula, where many ringing recoveries are found. LACK (1963) suggested that this pattern had evolved to reduce the danger of westward drift into the Atlantic under easterly winds. EVANS (1966) proposed that taking advantage of prevailing upper-air winds was the main reason; i. e. commonly prevailing W or WNW winds were favourable to migration towards east, but not west, of south.

The suggestion by EVANS (op. cit.) may also apply to the situation in Scandinavia. While W-NW winds (favourable for SE-migration) prevailed on 60 days during October in the ten-year period 1964—1973 (winds measured at 500 m altitude at Gothenburg), NW-E winds (favourable for SW-migration) prevailed on only 45 days. Furthermore wind speeds are higher for the former category; median wind speeds were 37 km/h and 22 km/h, respectively.

Visible Redwing and Fieldfare migration towards approximately SW regularly occurs at Falsterbo (site 6, Fig. 1), as was the case on several days during 1973 (Tables 1 and 2), but no mass migration comparable to that at site 8 on 10. Oct 1973 has ever been recorded. Thrush migration towards the west along the south coast of Skåne was recorded at site 7 (Fig. 1), and departures from the peninsula at site 3 also reflect migration west of south.

Do the visible thrush movements towards west of south in southern Sweden to some extent consist of birds, which have earlier migrated towards SE/SSE?

On 10. Oct. 1973, the heavy migration of Redwings at site 8 and over the Baltic Sea coincided with southward (according to the field observer; in fact, the direction of migration was probably east of south as no thrushes were noted at sites 1, 3 and 4 at the west coast) migration at site 2 and with SW/W-migration at sites 6 and 7 The time distributions of thrush migration during this day at the different observation sites are illustrated in Fig. 6. The southeastward migration started earlier in western Sweden (site 2) than in Skåne as the region was cleared from rain from the west during the morning. The westward movements (sites 6 and 7) occurred still later and thus could possibly comprise reoriented SE-movements.

At site 3 peaks of Fieldfare migration were noted on 3., 11. and 14. Oct. 1973 (Table 1), i. e. on days immediately after the SE/SSE-migration (Table 3). Likewise considerable thrush migration at Falsterbo was seen on 19. and 30. Oct. 1973 (Table 2) after SE/SSE-migration had occurred on 18. and 29. Oct. Fairly large numbers migrated at Falsterbo also on 27 Oct. 1973, but no southeastward movements were noted on the preceding day although WNW winds prevailed (cf. p. 9). The most intensive passage of Redwings ever recorded at Falsterbo (7650 individuals) occurred on 15. Oct. 1954 immediately after WNW winds had prevailed (LENNERSTEDT 1958).

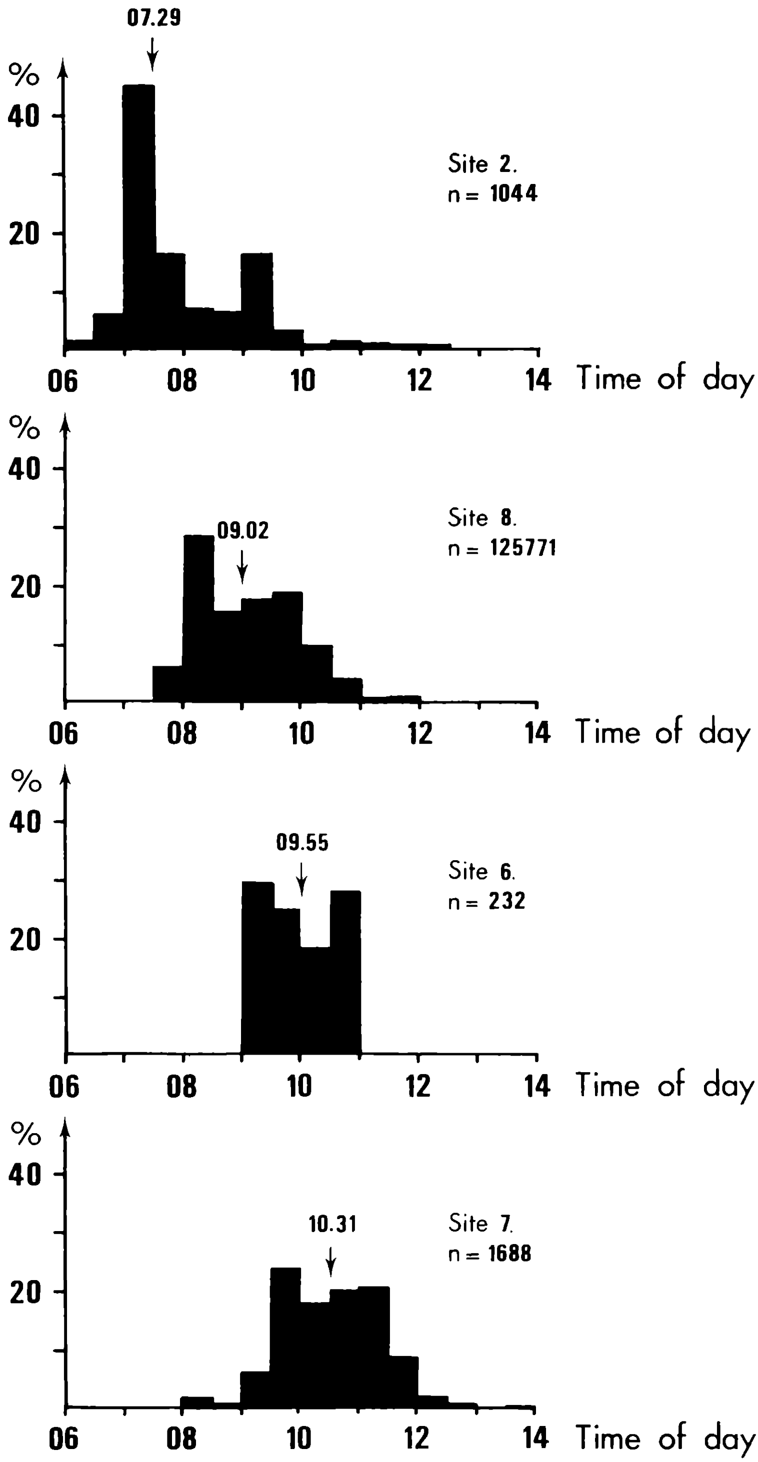



Fig. 6: Time distribution of thrush migration on 10. Oct. 1973 at field observation sites 2, 8, 6 and 7 The arrows denote the median times of passage.

Inspecting weather at sites 3 and 6 in relation to the thrush migration reveals that the movements occurred with about easterly winds at the former site and SSW-WNW winds at Falsterbo. This corresponds to the wind directions generally correlated to intensive passerine migration at these sites (ALERSTAM & ULFSTRAND in press). GUNNAR ROOS (pers. comm.) points out, however, that the composition of passerine migration at Falsterbo is distinctive on days with Redwing migration. Many Bramblings *Fringilla montifringilla* and Yellowhammers *Emberiza citrinella* in relation to Chaffinches are generally noted. The Redwing migration at Falsterbo is possibly also correlated to that of the Siskin *Carduelis spinus* and Snow Bunting *Plectrophenax nivalis*. Comparisons between the species composition of visible migration at Falsterbo and Ottenby (RUDEBECK 1950) as well as at 16 observation sites in southern Sweden (ALERSTAM & ULFSTRAND in press) indicate that these species are relatively more common than the Chaffinch in southeastern than southwestern Sweden. They are thus more likely than the Chaffinch to participate in the passerine movements (both diurnal and nocturnal) towards SE/SSE, which are observed, preferentially with WNW/NW winds, on the radar. It might be a rewarding task to relate the composition of migration at Falsterbo to preceding wind conditions (indicative of the radar pattern of migration). From the present data, however, it could not be decided if the same Redwings participated in the successive movements towards east and west of south, respectively.

Heavy nocturnal migration towards SSW/SW over southern Sweden was sometimes recorded immediately after nights with southeasterly migration (ALERSTAM et al. 1973). These movements, however, took place with winds most favourable for SSW/SW-migration and again no correlation between SE/SSE- and subsequent SSW/SW-migration per se is possible.

C: According to this hypothesis the birds select between two preferred track directions. With northerly or northeasterly winds they set out on a track direction towards SSW/SW and the movements are noted over the Norwegian and North Seas. With WNW winds the birds set out on the alternative track direction towards SE/SSE as witnessed in this study. The reorientation at dawn of thrushes over the Norwegian and North Seas (LACK 1963, LEE 1963 and MYRES 1964) towards SSE could be related to such a change from one preferred track direction to the other. This mechanism may have evolved to enable the birds to migrate more frequently with favourable winds (cf. EVANS 1966).

In this context it could be mentioned that radar studies of diurnal passerine migration over southern Scandinavia (ALERSTAM & ULFSTRAND in press.) revealed distinct cohorts migrating with preferred track directions towards SSW/SW and SE/SSE, respectively. The mean preferred track direction of the former category shifted gradually from about 190° over the northwestern part of the study region (south of Norway) to about 210° over the southeastern part (Skåne and the Baltic Sea) in a manner similar to that described for the Chaffinch by PERDECK (1970). The surprising fact was that the direction of the SE/SSE-movements shifted significantly along the same geographical axis towards more easterly directions (from about 160° to about 140°)! As a consequence the direction halfway between the track directions of the SSW/SW- and SE/SSE-migrating cohorts was about the same, 173° (± s. e. 1°, n = 12), throughout the study area. As this direction is close to south one might speculate that the birds orient in such a way that they could fly on a fixed track direction towards a certain angle west of south (under easterly winds) or towards the same angle east of south (with westerly winds). This speculation is of course valid only if the same birds to some extent participated in both categories of movements (SSW/SW and SE/SSE), which by no means is certain.

## 8. Acknowledgements

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## 9. Summary

Diurnal autumn migration of the Redwing *Turdus iliacus* (possibly also the Fieldfare *Turdus pilaris*) towards SE/SSE over southern Sweden was studied by radar in October and November 1972 and 1973.

One day of heavy Redwing migration (125 000) along the east coast of Skåne, as noted by field observations, allowed identification of the characteristic radar echo pattern. The air speed of the birds was 46 km/h.

The movements were heavily influenced by leading lines and concentrated departures over the Baltic Sea took place at peninsulas or abrupt bends of coastlines, dominantly at the southeastern corner of Skåne.

Migration was noted on 14 days during the two autumns and coincided with the WNW-winds in the rear of a low pressure passing eastwards over central or northern Scandinavia. Consequently ground speeds were high, 55–99 km/h.

The birds adjusted their heading direction in order to compensate for wind drift, but still there was a slight effect of wind on daily mean track direction.

It is well known that West Scandinavian Redwings set out on migration also towards about SW. SE/SSE-migration over southern Sweden could be explained if part of the autumn thrush population in western Scandinavia winters towards the southeast. Alternatively, different parts of this population use different migratory routes, one of them constituting initial southeastward migration and reorientation towards southwest over continental Europe. Still another possibility is that individual birds can select between preferred track directions towards SSW/SW and SE/SSE to be able to migrate more frequently with favourable winds.

## 10. Zusammenfassung

Der Zug der Rotdrossel in südöstlicher Richtung über Südschweden

Der Herbstzug der Rotdrossel *Turdus iliacus* (möglicherweise auch der Wacholderdrossel *Turdus pilaris*) wurde in SE/SSE-Richtung am Tage über Südschweden mit Hilfe eines Radargerätes in der Zeit von Oktober bis November in den Jahren 1972 und 1973 studiert.

An einem Tag mit – laut Feldbeobachtungen – kräftigem Zug von Rotdrosseln (125 000) entlang der Ostküste Schonens konnte man das charakteristische Bewegungsmuster der Radarechos erkennen. Die Eigengeschwindigkeit der Vögel betrug 46 km/Std.

Die Zugbewegungen wurden stark von Leitlinien beeinflußt und der Wegzug über die Ostsee war auf die Halbinseln oder Orte, an denen die Küste markant abbiegt, konzentriert. Der Wegzug überwog an der südöstlichen Ecke Schonens (Sandhammaren).

Vierzehn Tage lang wurden während dieser beiden Herbste Vogelzüge notiert, und zwar immer im Zusammenhang mit WNW-Winden auf der Rückseite von Tiefs, die ostwärts über Mittel- und Nordskandinavien zogen. Daraus ist zu schließen, daß die Fluggeschwindigkeiten der Vögel hoch waren, nämlich bei 55–99 km/Std. lagen.

Die Vögel zeigten eine deutliche Tendenz, die Winddriftung auszugleichen, auch wenn eine geringe Windbeeinflussung der Flugrichtungen anzunehmen war.

Man weiß, daß die Rotdrosseln Westskandinaviens auch in südwestlicher Richtung ziehen. Ein SE/SSE-Zug über Südschweden kann so erklärt werden, daß ein Teil der westskandinavischen Herbstpopulation von Drosseln im Südosten überwintert. Man könnte sich auch denken, daß diese Population zum Teil entlang verschiedener Wege zieht: Einer dieser Wege verläuft anfangs in südöstlicher Richtung und dann durch eine Richtungsänderung in südwestlicher Richtung über das kontinentale Europa. Noch eine Möglichkeit besteht darin, daß einzelne Vögel zwischen bestimmten Flugrichtungen nach SSW/SW oder SE/SSE wählen können, um öfter unter günstigen Windbedingungen ziehen zu können.

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# Lautäußerungen junger Trottellummen *(Uria a. aalge)* als individuelle Merkmale

Von Mathilde Schommer und Beat Tschanz[1])

**Inhaltsverzeichnis** Seite



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