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# Wind drift during the spring migration of the Common Scoter *(Melanitta nigra)* and the Long-tailed Duck *(Clangula hyemalis)*

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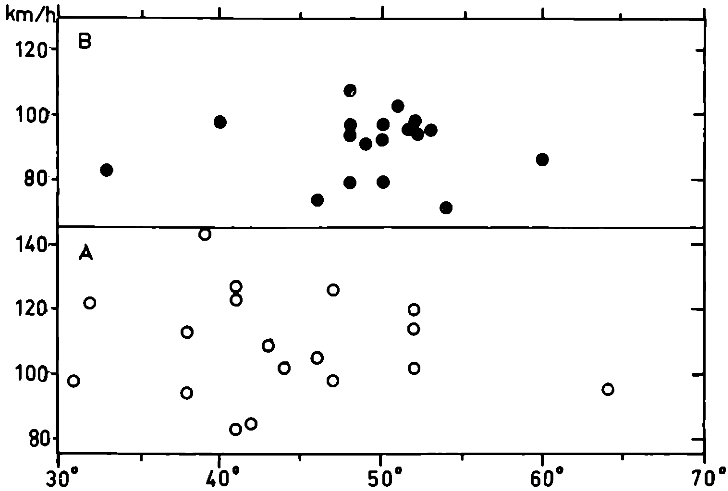
In the years 1960–1962 we (Bergman & Donner, 1964) using radar studied the spring migration through the Gulf of Finland and across southern Finland of the Common Scoter (*Melanitta nigra*) and the Long-tailed Duck (*Clangula hyemalis*). The presence of two different methods of orientation could here be demonstrated: (I) during migration in daylight and with a good visibility even at night the birds migrated along the northern coast of the Gulf of Finland approximately in the direction 70–80° eastwards, and (II) when flying over land or over the sea far from land the main direction of the migration was about 45° (NE). In the first case the birds maintained a more or less constant track using the coast as a guideline and thus compensated in their flight for drift by the wind. Except for variations in the intensity of migration, the only notable effect correlated with the direction of the wind was that with winds from S to E the migration was observed closer to the coast than in the case of winds from other directions. In the second case (II) there was a greater spread of the directions of the tracks. With winds from north to west they were more easterly, and with winds from south to east more towards the north as compared to the general direction towards NE observed on nights with very little or nearly following winds. When the material was corrected for the drift caused by the wind these differences became insignificant, thus indicating that the birds migrated on a constant heading without compensation for drift.

Later studies with radar, mainly on passerine migration, have indicated that cross-winds do not cause much deviation of the mean tracks, at least not as much as would be expected if there were no compensation for drift (Drury & Nisbet, 1964, 1967; Evans, 1966). Lack (1969) has also reconsidered his earlier data and found that they support the view that migrants normally maintain their preferred track directions despite the wind. Both Evans (1966) and Nisbet & Drury (1967) explain the observations of apparent deflections of the tracks by the wind assuming a general tendency of the birds to migrate in following winds. In a certain weather situation thus only those migrants with approximately the same directional tendency as the direction of the wind would migrate, giving a false impression of drift by the wind. On the other hand Parslow (1969) studying with radar the passerine migration across the English Channel has obtained good evidence for migration on a constant heading with uncompensated drift by the wind. The visual observations of Gauthreaux & Able (1970) also demonstrate the absence of wind compensation in the nocturnal migration of songbirds.

The results of different investigations are thus to some extent contradictory. In view of this it is worthwile to reexamine this question for the duck migration studied by us, specifically regarding the kind of migratory flight [cf. above (II)], which presumaby is based on celestial orientation and during which, according to our previous work (Bergman & Donner, 1964), the birds do not compensate for drift. For the present analysis previously unpublished material collected in the spring of 1963 has been used. Between May 19 and 26 we arranged observations with radar, recording the p. p. i. display on 16 mm film (cf. Bergman & Donner, 1964). Simultaneously radar measurements of the average altitude of migration were undertaken as well as pilot balloon measurements of the wind in the area of study. Each night




A. Mean track directions and ground speeds for 18 ocassions 19.–26. V. 1963 as recorded by radar. B. The same material as in A corrected for the effect of the wind, thus giving the heading and the air speed of the migrating Common Scoters and Long-tailed Ducks.

the migration and the wind was thus recorded at 21.00, 24.00 and 02.00 hours. From the films of the p. p. i. display the direction of the tracks and the ground speed of single flocks were measured. This is easily done with the large and distinct radar echoes obtained from the flocks of ducks, usually consisting of 100—150 birds. As a particularly well suited area for this purpose the region around Lake Saimaa in SE Finland was chosen. Here the ducks pass on their way from the Gulf of Finland to the White Sea in the spring, in the majority of cases this flight is presumably performed in a single night. In this particular area there are no regular shorelines, thus guidelines or landmarks that could be used by the birds are absent. This is also shown by the fact that the tracks of the flocks are almost invariably nearly straight lines over distances of 50 km and more. It should be stressed that on all occasions practically no other migratory movement giving at all comparative radar echoes was observed.

On 18 occasions during the week of this study it was possible to obtain reliable measurements of the mean direction of the tracks and of the ground speed, together with data on the altitude of flight and on the wind at this altitude. In Fig. A the mean track direction as a function of the mean ground speed is given (circles) for each of these occasions, as measured from between 5 and 50 (usually about 20) flocks. The directions were in each case generally very uniform, with individual variations between 2 and 3 °, and the ground speed of the flocks varied within $\mp$ 5 % in each instance. The average altitudes of flight varied between 400 and 1300 m, occasional flocks were recorded between 2000 and 3000 m. This material (Fig. A) shows a large variation in the track directions and ground speeds obtained. The material was then corrected for the effect of the wind measured at the average altitude of migration in each case. The result is shown in Fig. B. In the large majority of cases the headings so obtained and the air speeds of the birds fall within very narrow limits. Only in three cases the values deviate significantly from the main group. These cases, however, refer to rapidly changing weather conditions with a lot of clouds and some signs of disorientation, the tracks recorded being less straight than in the rest of the cases.

The average heading of the material in Fig. B is 49.5 ° and thus close to the value 48.5 ° that we obtained for this area for the spring 1962. The average air speed is 91.7 km/h as compared to the earlier value 92.7 The data of Fig. B again demonstrate the astonishing precision of the orientation mechanism of these birds. Earlier we estimated that they should be able to maintain their heading with an accuracy of 1—2 ° (BERGMAN & DONNER, 1964). This is fully supported by the present data, considering that some errors are still inherent in the measurements.

As stated above, three different ways of orientation can be proposed: (I) migration along constant tracks with compensation for drift, (II) migration on a constant heading with no compensation, and (III) migration with or without compensation but only in strictly following winds. Figures A and B can be used to discriminate between these possibilities. If the first alternative would be correct the measured directions of the tracks would be expected to fall in a narrow interval and after correction for the wind the headings would be expected to vary considerably. This is clearly not at all the case. The third alternative is also excluded, because the headings calculated after wind correction would not then fall into the same group. And the measured ground speeds ought to give the sum of the wind speed and the air speed of the birds, which is not the case. It would, in addition mean that in calm weather a lot of different directions would be represented in the material which is not the case as judged from several such instances from our previous work. The re-interpretation of our previous data in terms of this kind of migration, as suggested by NISBET & DRURY (1967), is thus not consistent with the present results. Only the second alternative, migration on a constant heading with no drift compensation, would be expected to give the picture obtained in Fig. A—B. The results thus confirm our previous conclusions (BERGMAN & DONNER, 1964). However, it should once more be emphasized that these ducks show a different migratory behaviour in the presence of sufficiently distinct topographical cues, such as the southern coast of Finland, particularly in daylight and with a good visibility.

## Summary

Radar observations in combination with simultaneous wind measurements confirm our previous conclusion that the Common Scoter and the Long-tailed Duck migrate over land with a constant heading, without compensation for wind drift.

## Zusammenfassung

Radar-Beobachtungen mit gleichzeitigen Windmessungen bekräftigen unsere frühere Schlußfolgerung, daß über Land ziehende Trauer- und Eisenten einen konstanten Kurs halten, ohne vom Wind verursachte Abdrift auszugleichen.

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## References

Bergman, G. & Donner, K. O. (1964): An analysis of the spring migration of the Common Scoter and the Long-tailed Duck in southern Finland. Acta zool. fennica 105: 1—59. • Drury, W. H. & Nisbet, I. C. T. (1964): Radar studies of orientation of songbird migrants in southeastern New England. Bird-Banding 35: 69—119. • Evans, P. R. (1966): Migration and orientation of passerine night migrants in north-east England. J. Zool., Lond. 150: 319—369. • Gauthreaux jun., S. A., & Able, K. P. (1970): Wind and the direction of nocturnal songbird migration. Nature 228: 476—477. • Lack, D. (1969): Drift migration: a correction. Ibis 111: 253—255. • Nisbet, I. C. T., & Drury, W. H. (1967). Orientation of spring migrants studied by radar. Bird-Banding 38: 173—186. • Parslow, J. L. F. (1969): The migration of passerine night migrants across the English Cbannel studied by radar. Ibis 111: 48—79.