One right, many wrongs? The role of leaders in pigeon group navigation

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Theory predicts that navigational accuracy of birds with same homing goal increases with group size if they fly together (many wrongs principle, Trends Ecol. Evol. 19:453-456). Indeed homing pigeons prefer to home in groups if allowed to do so. However, few studies have directly tested the navigational advantage of group navigation and their results remain controversial. Moreover, during races pigeons from different lofts are usually released together. This creates a conflict between the tendency to fly in groups and the aim to home along the shortest possible trajectory. We exploited recent technological developments and used micro-GPS loggers (www.newbehavior.com) to precisely record homing tracks. The collected data allowed us to test directly whether group navigation improves navigational accuracy and to investigate how orientation conflicts are resolved in mixed groups comprising birds with different homing goals.

A first experiment involved 6 experienced pigeons from a loft in Testa di Lepre near Rome. They were trained in a series of single releases to home from St. Severa located at a distance of 30 km until their homing speed became asymptotic. Thereafter, they were allowed to home from the same site as a group. 53 individual tracks were collected and analyzed using the public domain software Wintrack (www.dpwolfer.ch/wintrack). Based on GPS timestamp and position information of the individual birds, we calculated flying time and distance, as well as specific parameters assessing navigational accuracy and path linearity. We also determined exactly when birds were flying together and which individual within the flock was taking the lead. Finally, we determined to which degree the birds were following roads, highways and railway lines.

In a second experiment, we tracked the homeward journeys of pigeons from 6 different lofts distributed in an area of 55 x 55 km near Caen in northern France. Mixed groups comprising pairs of pigeons from three different lofts were released 2-4 times from 3 different sites (St. Marin, St. Clair, Beauvais) at distances of 30-190 km from their home lofts. 108 individual tracks totaling to over 15'000 km of flight were collected and analyzed using similar methods as in the first experiment.

Our data are consistent with the strong tendency of pigeons to fly in flocks for prolonged distances. The experiment near Rome confirmed that group flight improves homing performance and revealed that improved motivation as well as more accurate navigation contribute to the effect. The tendency to follow roads was significantly reduced in groups. Clear leadership was established during many group flights, but was not stable from flight to flight. Lack of leadership was predicted by single flights showing many rests. The experiment in France revealed that for 70% of the distance flocks consisted of birds from different lofts. If targets were disparate, this forced part of the flock members to make significant detours. While some branched off just in time at a right angle to reach their loft, others seemed to loose orientation or attempted even to fly back toward the release site after separating from the flock. Again, in most flocks clear leaders and trailers could be identified. In others, however, flight direction rather seemed to be determined by dynamic interactions between flock members. Our results suggest that interactions between pigeons belonging to different lofts are a significant factor influencing homing performance during pigeon races.

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