

Fig. S1 Additional examples of learning walks and foraging trips on the nest field. (A-C) First learning walks of three ants (category 1). (D-F) Three subsequent walks of the same ant (category 3) exploring all directions. (G-I) Three trips no. 3 (G), no. 6 (H) and no. 7 (I) of the same ant. The nest entrance is located in the middle of the landmark array (+) and surrounded by three landmarks (black filled circles). The grid size corresponds to 1 m on the nest field (the inner 4 m x 4 m are additionally subdivided into 0.2 m x 0.2 m boxes). The insets in A, B and C show the short paths in higher magnification (grid size corresponds to 0.2 m). The black arrows show the direction of the ants' paths (where applicable).

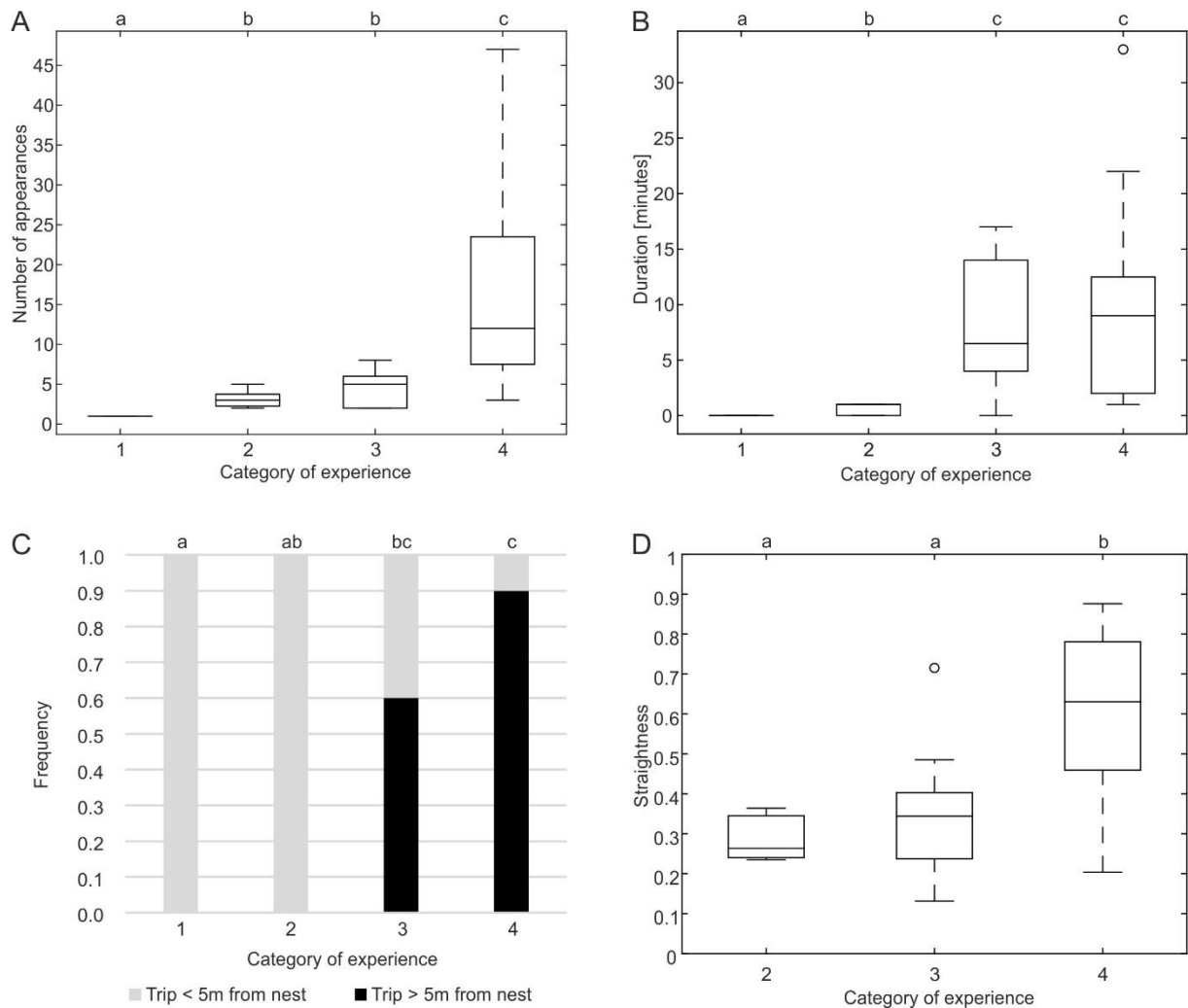


Fig. S2 Additional information concerning the learning walks of the test animals. (A) Number of appearances outside the nest of the ants in the different categories of experience. (B) Duration of the ants' trips outside the nest before being captured for the test. Since naïve (category 1) and unexperienced ants (category 2) leave the nest only for some seconds up to about a minute, the measurements of the duration outside the nest exact to the minute can only be a rough estimation for these categories. (C) Proportion of ants that left the nest field before the being captured for the test. (D) Straightness of the ants calculated as the proportion of maximal distance/length of path. If the ants left the nest field, straightness was calculated only for their outbound trip, whereas if the ants stayed on the nest field before being captured, straightness was calculated for the whole trip. The number of ants per category were $n=15$ for category 1, $n=7$ for category 2, $n=15$ for category 3, and $n=20$ for category 4. The central mark in the boxplots (A, B, and D) is the median, the edges of the boxes are the 25th and 75th percentiles, and the whiskers extend to the most extreme data points (excluding outliers). Outliers are plotted individually as „o“. The groups in the boxplots were statistically tested with the Kruskal-Wallis-Test ($\alpha=0.05$) and compared post hoc with the Mann-Whitney-U-test with Bonferroni-Holm correction. The groups in the bar graph (C) were compared pairwise with Fisher's exact test with Bonferroni-Holm correction ($\alpha=0.05$). Different letters indicate statistically significant differences between the groups.

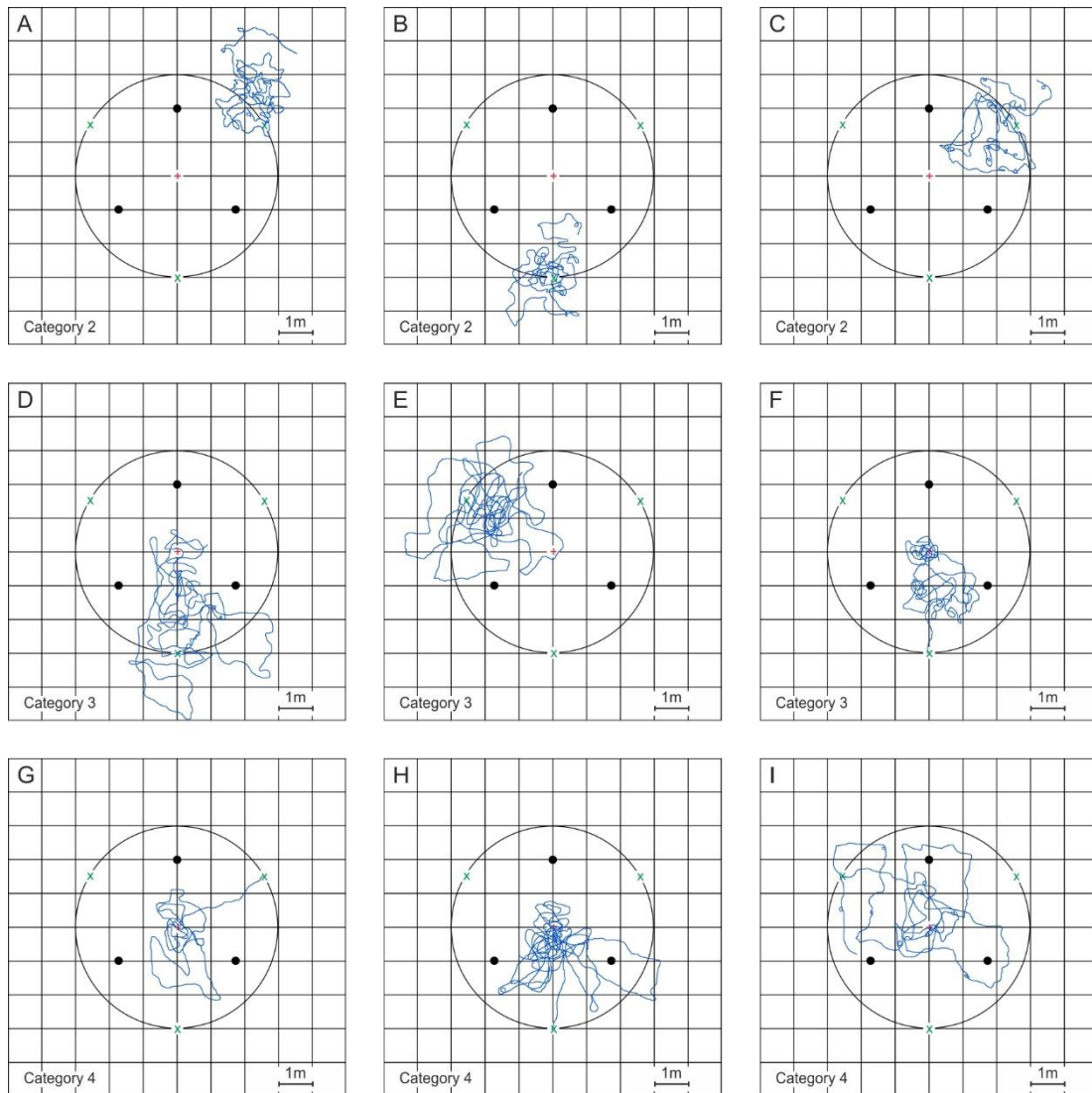


Fig. S3 Additional examples of searching paths on the test field. (A-C) Search paths of three ants in category 2. (D-F) Search paths of three ants in category 3. (G-H) Search paths of three ants in category 4. The fictive position of the nest entrance is located in the middle of the test field (+) surrounded by an identical landmark array as at the nest (black filled circles). The release points (x) lie 3 m away from the fictive nest entrance position. The grid size corresponds to 1 m on the test field.

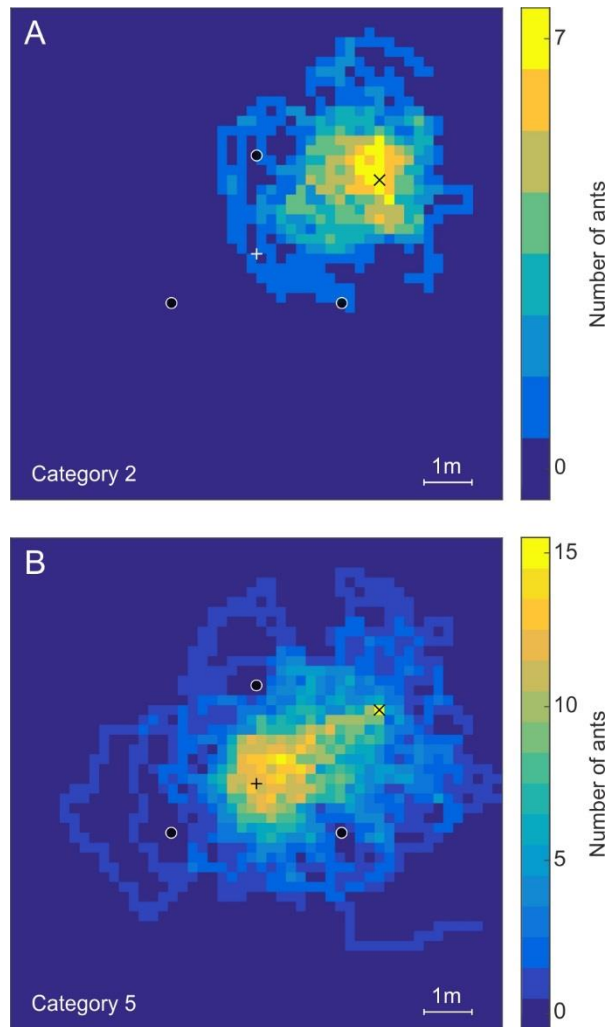


Fig. S4 Additional false-color maps of the superimposed searching paths of all ants in categories 2 (A, $n=7$) and 5 (B, $n=15$). The fictive position of the nest entrance is located in the middle of the test field (+) surrounded by an identical landmark array as at the nest (black filled circles). The release point (x) lies 3 m away from the fictive nest entrance position (all data is superimposed so that all ants start at the release point northeast of the fictive nest entrance). Each pixel of the false-color maps is equivalent to a 0.2 m x 0.2 m square on the test field. Dark blue pixels have not been visited by any ant, whereas yellow indicates that all ants of a category crossed the pixel (the number of test ants for each corresponding color is given next to the color bar).

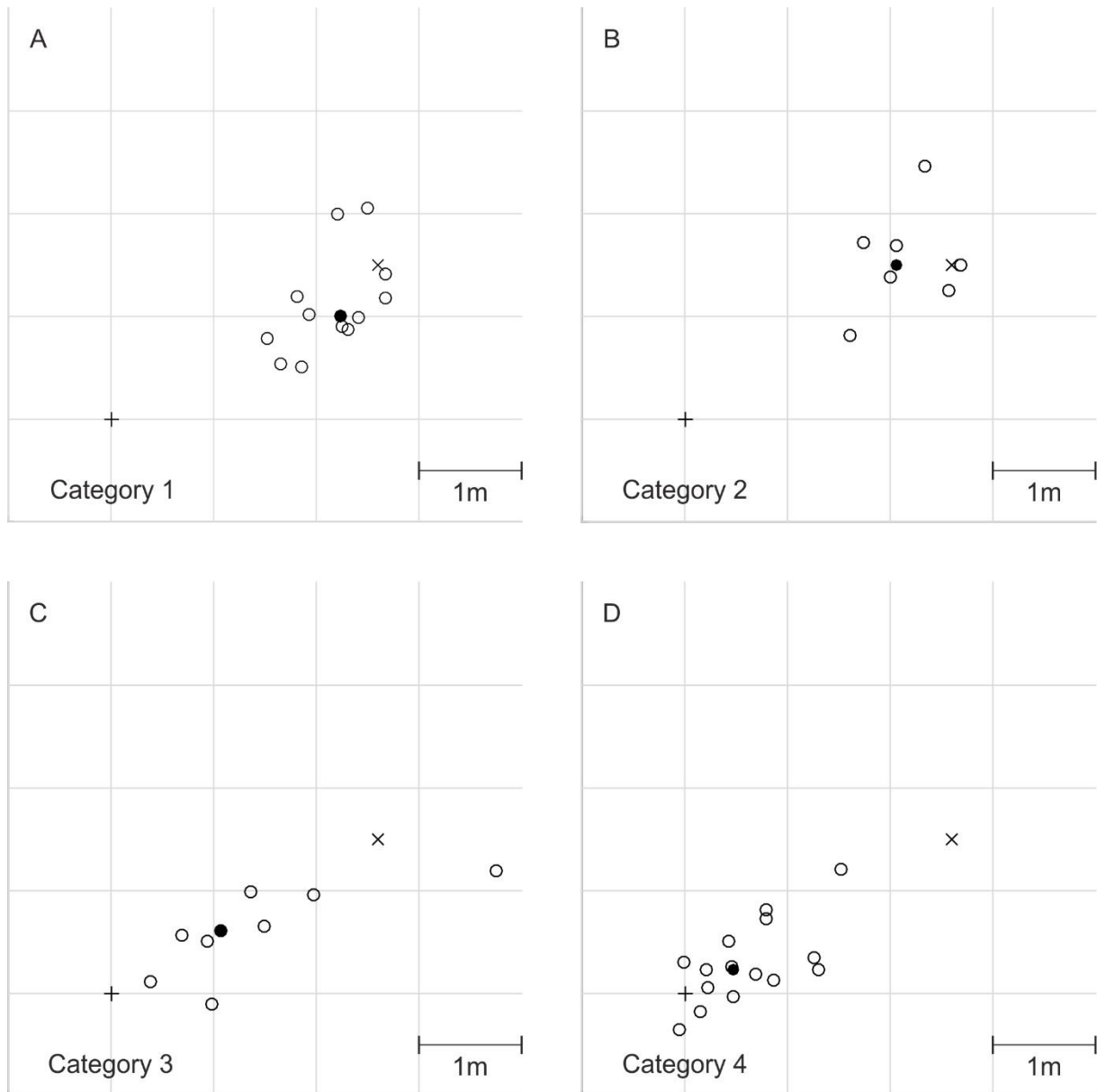


Fig. S5 Median search centers of the ants. The scatterplots (A) category 1 (n=12), (B) category 2 (n=7), (C) category 3 (n=9), and (D) category 4 (n=15) show the same data as the boxplots in fig. 4. The search centers of individual ants are shown as "o" and the search center of the corresponding categories is shown as a filled black circle. The release point (x) lies 3 m away from the fictive nest entrance position (+). All data is superimposed so that all ants start at the release point northeast of the fictive nest entrance. The grid size corresponds to 1 m on the test field.