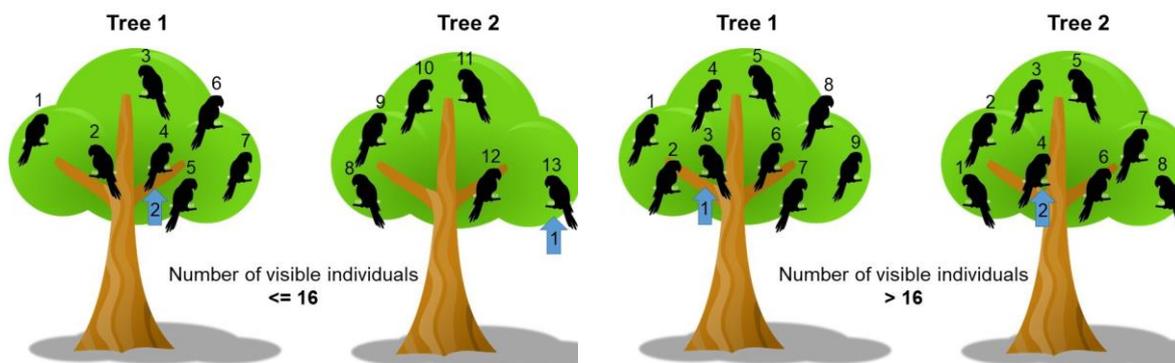


**Supplementary material:** Detailed description of methodology used for random individual selection during group sampling.

As the total number of individuals could not be pre-defined, several lists were created with maximum numbers of 8, 12, and 16 (and random numbers of up to 4, 6, and 8, respectively, in their  $\frac{1}{2}$  columns; Figure S1a), which could be used for varied group sizes, with 16 being a maximum number that was considered feasible to count to in each interval.

INTERVAL	<1/2	>1/2
1	3	13
2	4	15
3	7	3
4	1	4
5	8	13
...	...	...

(a)



(b)

(c)

**Figure S1.** Schematic representation of the method for random selection of individuals during focal interval sampling of groups, used while sampling free-living scarlet macaws in Costa Rica. (a) List of random numbers created for individual selection in each interval, based on a group of up to 8 (<1/2 column) or 16 individuals (>1/2 column). (b) Schematic representation of random individual selection based on relative position within the group, when the number of visible individuals was up to 16 individuals, and (c) when the number of visible individuals was greater than 16. Arrows represent the individuals that would be selected in intervals 1 and 2 in each scenario, based on the numbers on the list.

When there were more than 16 visible individuals, they were divided into subgroups based on location and alternated between sessions (e.g. each tree, or half tree, with visible individuals sampled

in rotation on successive intervals; Figure S1c). For example, in the scenario where there are 13 parrots visible across two trees (Figure S1b), the whole group, which has less than 16 parrots, is used for random individual selection. In the first interval the 13th individual (number "13" on the list; Figure S1a) is sampled, while in the second interval the fourth individual (number "4" on the list; Figure S1a) is selected. The figure in the left column was used in this situation because the number in the right column is 15 and there are only 13 visible individuals. In the scenario with 17 visible parrots across two trees (Figure S1c), they are divided into two subgroups of nine parrots in tree 1, and eight parrots in tree 2. In the first interval, the subgroup on tree 1 is sampled, with the 3rd individual selected (number "3" on the list; Figure S1a), and in the second interval, the subgroup on tree 2 is sampled and the fourth individual is selected (number "4" on the list, Figure S1a) (Figure S1c).