

In the group of altricial birds, nestlings depend their parents who deliver them food directly to the mouths. During each feeding, nestlings simultaneously stretch their necks, open their mouths wide and make intense voices. In the case of chicks, this set of behaviors is called begging, and its primary function is to draw the attention of parents and encourage them to deliver the food. The loudness of voices, the intensity of movements and the color of the beaks may reflect the degree of hunger and the condition of the brood. The yellow edges of the beaks and the red interior of the mouth, colored with carotenoids, become paler, e.g. due to infection or malnutrition. In turn, the decrease in the intensity of vocalization reflects the lower body mass and size of the nestlings. The coexistence of many simultaneous methods of begging is called multimodal communication - that is, using different transmission channels - in this case, visual and acoustic.

In addition, the quality of signals sent by the nestlings can be modified by external factors. For example, nestlings which broadcast loud squeaks may attract the attention of predators, and that is why under less threatening conditions (e.g. while nesting in hollows), voices are usually louder than those in open nesters. Nest luminosity is less-studied factor potentially affecting the parents - nestlings communication. In cavities, in which the nestlings are raised in almost complete darkness, acoustic signals more than visual signals can be expected to be preferred. Comparative research suggests the existence of such correlations. Little is known about the extent to which the behaviors associated with begging within one species that can nest varied light conditions are plastic.

The aim of the project is to find the answer to the above question during research on the great tit (*Parus major*) population nesting in modified nestboxes. In some of them, the only source of light will be the entrance hole, while the luminosity of the rest of nestboxes will be enhanced with small plastic windows. Using the methods of reflectance spectrophotometry, bioacoustic measurements and chick movement analysis, we will test the influence of light on the multimodal communication of the great tit nestlings. It can be expected that under enhanced light conditions, the nestlings will have more intensely colored mouths because their color will be clearly visible to parents. We also assume that these nestlings are going to vocalize more quietly. In turn, in traditional, dark boxes, the chicks will broadcast more intensely, because this is the most effective way to mark their presence in darkness. In this experimental group we should also expect poorly colored beaks, because the allocation of expensive carotenoid pigments that cannot be seen in the dark is not very profitable from the point of view of energy expenditure. In addition, less pigment in the mouth tissues provide them more contrast and thus more visible in low light. The movement of the nestlings during feeding will be also analyzed.

The obtained results may broaden our knowledge about the benefits and limitations resulting from multimodal communication under changing luminosity conditions. For sure the potential results of our project might be linked with many ecological issues even those derived by urbanization and the influence of artificial light on animal signals adaptiveness.