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Why wildlife-warning reflectors do not work and how they can still be useful

Collisions with large animals are not only a significant economic problem but also an animal welfare issue and, in some situations, even an ecological dilemma. A significant proportion of wildlife-vehicle-collisions occur on rural roads during dawn and night. The objective of wildlife-warning reflectors (WWR) is to reduce this type of accidents. These devices have been available in many types and shapes for decades, and their common operating principle is to reflect the headlight of approaching cars into the adjacent verge to prevent nearby animals from entering or crossing the road. Today, most of the reflectors are designed to alter the colour of light or to flash or twinkle for an additional stimulus. While some studies show a reduction of collisions, others are not demonstrating a significant accident reduction. Therefore, we decided to address the topic by validating the functional principles of WWR's concerning the eyesight of commonly affected wildlife species. For that reason, the reflection characteristics of nine commercially available WWR's were measured in a lighting lab, and a literature review on animal vision and colour perception was conducted. The collected data were used to simulate the WWR's visibility for wildlife animals in about 3,000 patterns of approaching vehicles and approaching or observing animals. The simulations were performed concerning German legal regulations on road design and headlight characteristics. Depending on the observer's position, the amount of reflected light differed considerably. Some WWR's showed limited lighting effectiveness for each WWR, which had to do with the different combinations of the approaching vehicles distances, and the observer's position, when only under active high beam headlight. Nevertheless, none of the tested WWR's was able to generate enough optical reflection to create stimuli, regarding differences in a complicated situation of an approaching vehicle by wild mammals. As a consequence, possible explanations of the observed reduction of wildlife collisions after the installation of WWR's in some long-term studies may be a much differentiated and by far unknown system of visual perception in wild ungulates. It could also be increased alertness of the vehicle's driver, stimulated by the WWR.