Critical examination of American Bird Conservancy's (ABC) campaign to avoid bird collision

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Introduction and background

Avian window collision is based on the two phenomena transparency and specular reflection. This issue has recently received increased attention in a number of countries. On their homepage, the NGO American Bird Conservancy (ABC) issues recommendations and certifications for products classed as "highly effective" and "effective" [1]. The recommendations and certifications are largely based on choice experiments, which in turn are stated as being derived from a method used in Europe: "Our testing strategy is based on the work of Martin Rössler in Austria. The Austrian testing protocol uses a device commonly called 'the tunnel,' which was developed to test free-standing glass, such as that used in highway noise barriers or 'wind walls'" [2]. The method of Martin Rössler mentioned here is a choice-experiment setting using the Flight Tunnel II at the Biological Station Hohenau-Ringelsdorf, Austria [3].

In these experiments, birds can choose to fly either towards a marked test pane or towards an unmarked reference pane. If birds fly entirely according to chance, then 50% of flights are directed towards the test pane and 50% towards the reference pane. Not every statistically significant deviation from this random distribution is of conservation relevance. For a marking to be considered "effective", considerably fewer birds have to fly towards the pane with this marking than towards the reference pane. The Austrian recommendation, widely accepted in German speaking countries, sees three categories of markings (Tab.1). Only if less than 10% of flights are directed towards the test pane, is the tested product classed as "highly effective". If 10–20% of flights are directed towards the test pane, such products are classed as being of "limited suitability". If the proportion of flights towards the test pane is higher still, the tested markings/products are classed as being of "poor suitability" [3].

Tab. 1: Categories based on the proportion of flights towards the test pane in the flight tunnel [4].

Category	Effectiveness of marking	Flights towards test pane in %
A	highly effective – „bird protection glass"	less than 10
B	limited suitability	10-20
C	poor suitability	20-45

In 2010, with normative rule ONR 191040, the Austrian Standards Institute declared this experimental setting the standard for testing the effectiveness of glass markings aimed at reducing bird collisions under transparency conditions [5]. At the same time, this normative rule established the term "bird protection glass" for markings classed as "highly effective". The experimental setting has since been refined to also consider specular reflections. We do not recommend products of "poor" or "limited suitability" as bird protection measures. These standards are currently applied for recommendations in German-speaking countries ([4]; cf. [6]).

ABC has also drawn on its activities to issue its own recommendations as well as for official certifications ("LEED Credit") [7]. In part, these recommendations and certifications pertain to products which were also tested in Austria, where they were, however, classed as being of "poor suitability" or ineffective due to the test results. To avoid confusion, but also to prevent recommendation and application of products that are insufficiently effective in our view, we would like to present the differences between ABC and European study and classification methods.

ABC-Criteria for tested measures / certification

The basic information provided by ABC raises questions and is not entirely comprehensible from a methodical and technical point of view.

- Low threshold values

Initially, ABC also used the Austrian standards for threshold values. These were later changed and lowered. They now diverge considerably from the standards in Austria [5]. Products classed in German-speaking countries as being of "limited suitability" (more than 10% of flights towards the test pane in the tunnel choice experiment) or of "poor suitability" (more than 20%) and which are therefore not recommended ([4], Tab. 1), are classed by ABC as being "effective" even if 30% of flights are directed towards the marking (ABC uses the corresponding 70%-value of flights towards the reference pane). There was no international technical consultation on this matter.

- Different threshold values applied by ABC for flight tunnel experiments and field tests

Tested products are classed as "effective" or "highly effective" using different threshold values, depending on whether the marking was tested in a flight tunnel or as a "field test". For example, the requirements for classification as "effective" are: "Publicly available study indicating either at least an 80% reduction of bird collisions in field tests or controlled testing indicating at least 70% of birds tested fly towards the control" [1]. The basis for these threshold values, and the difference between the two, is unknown. The definitions of "field tests" and "controlled testing" are equally unclear.

- No differentiation between test situations for transparency and specular reflection

What is more, no differentiation is made between tests conducted for transparency or specular reflection situations. In view of clear indications that specular reflections can significantly reduce the effectiveness of markings, such generalisation appears questionable.

- Unknown test methods for "ABC tested effective" [1]

Tested markings are assigned the classifications of effectiveness "highly effective" and "effective". With any given product, however, it is neither clear which of the conceivable test methods was applied, nor what the test results are exactly.

- Unclear combination of results

ABC states different threshold values for field tests and controlled tests in an experimental setting/flight tunnel [1]. Some materials were apparently tested using various methods. How these different test results from different test methods ("field tests" or flight tunnel, test situations for transparency or specular reflection) are combined to one overall value is not apparent.

- Lacking consideration of previous test results

A number of materials and markings were tested at different testing sites (e.g. the ABC testing site and the testing site Biological Station Hohenau-Ringelsdorf) with different results. Negative test results of other testing sites were neither considered nor mentioned in the overall evaluation of ABC.

- Indiscriminate recommendation

ABC recommends products and markings for all fields of application indiscriminately, even if test results are only present for *either* a transparency *or* a specular reflection situation. However, test results between these two conditions can differ considerably. Such generalised recommendation is not justifiable from a technical point of view.

Method of flight tunnel experiments

ABC conducts its own flight tunnel experiments (Powdermill Nature Reserve, Pennsylvania) using a replica of the Flight Tunnel II at the Biological Station Hohenau-Ringelsdorf, Austria [3]. Details of the experimental setting and procedure at Powdermill are not publicly available and therefore unknown; questions to this effect were not answered by ABC. Information gained from personal correspondence, e-mails and photos, however, raises doubts as to a methodically consistent experimental procedure. Our explicit points of criticism are:

- Lack of homogenous background

The tunnel is situated on the premises of the Powdermill bird banding station. The tunnel's surroundings are made up of buildings, driveways, parking spaces and various types of vegetation (see Fig. 1). Thus there is no homogenous background, which is, however, a precondition required by the method of the choice experiment.

- Size of the mirrors

The Hohenau tunnel is designed for transparency tests up to a maximum solar elevation angle of 52°. Greater elevation angles at midday around the time of the solstice mean obligatory interruptions to the experimental procedure. Photos of the Powdermill tunnel show that the mirrors, which direct even, parallel light towards the glass panes, are roughly the same size as those of the Hohenau tunnel. However, due to the geographical location and accordingly greater solar elevation angles, the mirrors would need to be considerably higher to enable an even illumination of the panes during solar elevation angles >52°. Otherwise, experiments would need to be suspended during these periods. At the solstice (21 June), given the location in Pennsylvania, this would be roughly between 9:30 and 14:45. There is no documentation as to whether this factor is considered.

Fig. 1: Powdermill tunnel setting with its surroundings and additionally mounted plywood boards. Photo provided by Chris Sheppard/ABC.

- Distorted citations

Referring to RÖSSLER [3], ABC claims in its certificates [8] that the results of UV-markings are underestimated due to the mirrors used in the tunnel setting. However, no such statement is made whatsoever in the cited publication.

- Quality control

To assure the validity of the flight tunnel experiment results, control trials and test repetitions are required as standard. No such procedures are known from the ABC tunnel. Reference tests need to address questions such as the following, to eliminate errors which could influence the test results: What do the birds actually react to? How do differences in brightness between reference and test pane influence the result? Merely referring to series of tests conducted elsewhere (e.g. "Hohenau Testing Protocol") is not enough to assure the validity of the experimental procedure regarding these questions.

- Use of plywood boards

The inhomogeneous natural background (see above) at the tunnel site was the likely reason for an artificial background to be mounted on the Powdermill experimental set-up. Plywood boards with a blue and white ("sky") background ("blue pattern") are apparently used to simulate the appearance of sky (Fig. 2). Measurements documenting how a plywood board, blue to the human eye, compares to the radiation characteristics of the sky are not available. It is unclear whether measurements of light and brightness were conducted. Likewise, the influence of the shadows cast on the boards (see Fig.1) is not known.

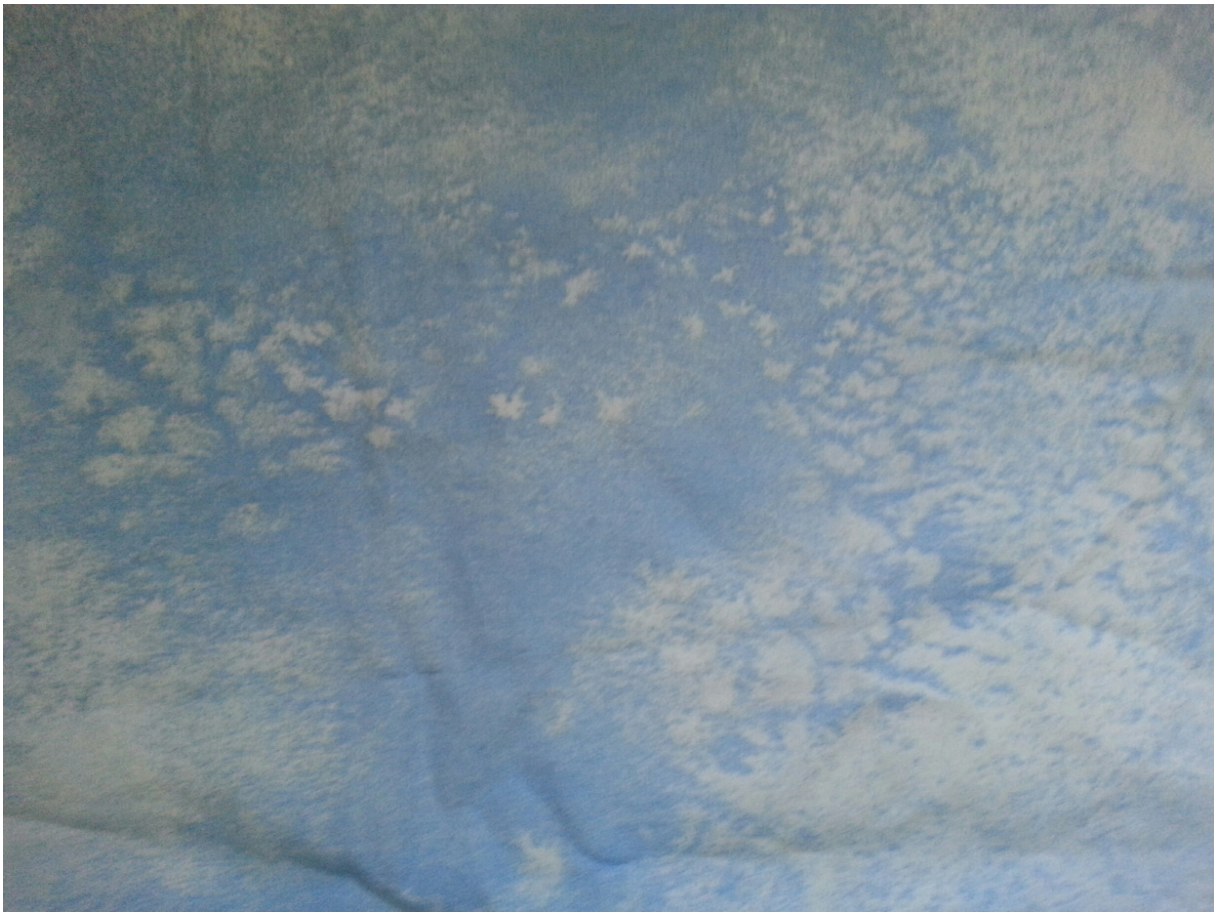

Fig. 2: Sky pattern on the plywood boards mounted at the end of the tunnel. Photo provided by C. Sheppard/ABC.

- Simulation of window situation (experimental setting for specular reflection)

ABC attempts to simulate a "window situation". A characteristic trait of windows are specular reflections as a consequence of the darker background of the room behind a window and the brightness of the foreground.

For this purpose, the experimental setting for specular reflection at the testing site in Hohenau, Austria involves mounting an actual small room with dark interior behind the panes, thus offering reflection characteristics that are as realistic as possible; the brightness of the background behind the panes is measured during the experiments. The panes face outward at 125° to the birds' flight path, thus reflecting the surrounding homogeneous vegetation.

ABC also recognises the need for a darker background behind the panes. However, the Powdermill tunnel is unable to provide a satisfactory testing situation for specular reflection ("window situation") for two fundamental reasons. Firstly: the panes at the end of the tunnel are mounted at right angles to the birds' flight path, and are thereby only able to "reflect" the dark inside of the tunnel. Secondly: plywood boards with "blue pattern" are mounted behind the panes (see above). Since these boards are illuminated by the sun head-on, they lighten the background rather than reducing the amount of light there.

With this experimental setting, it is impossible to achieve clearly visible reflections on the panes, such as they are characteristic for window situations in buildings. This means, in consequence: this experimental setting is actually a transparency setting, although it is intended to

test for specular reflection. Markings, coatings or film applied on the inside of insulation glass facing away from birds, or as an inner layer in laminated glass, remain visible before a light background and can be perceived by the birds. In a specular reflection situation, however, these would be overlaid with reflections of the surroundings, thus becoming scarcely perceptible. Furthermore, it is not known how the birds react to the plywood boards. The reciprocal effects of the panes, the mist net, the markings and differences in brightness due to films, as well as the blue plywood boards could only be ascertained through comprehensive preliminary trials.

In our view, the experimental setting is not suited to address questions regarding transparency or specular reflection situations, and to assess markings in a meaningful way. The results of the Powdermill tunnel contradict the results of the Hohenau experiments because the effect of markings is overestimated with this methodical approach and experimental setting. The ABC certifications of markings based on the experimental setting at Powdermill appear questionable to us for these reasons.

Interpretation of results from the flight tunnel

The unclear and methodically questionable approaches for the flight tunnel experiments are continued in the application and interpretation of the results.

- Transferability of results from flight tunnel experiments to real-life situations

Results from flight tunnel experiments or field tests with standardised test methods can only be used to compare the effectiveness of different markings in relation to each other. However, ABC apparently assumes transferability of such results to real-life situations ("reduction of bird collisions"). The scientific basis for this assumption has not yet been established. Collision probability in the field is influenced by many different, changing factors. In an experiment, on the other hand, the influencing factors are standardised and reduced to a minimum. To draw conclusions about the complex circumstances in the field from the simplified situation in a flight tunnel is extremely difficult and not valid in our opinion.

- Transferability of results from field tests to real-life situations

ABC also expresses "(x)%-reduction of bird collisions" for field tests [1]. Regardless of the chosen test method and despite the question of transferability, they hereby suggest that the field test results can be transferred to real life situations. However, once more, no scientific basis for such claims has yet been established.

- Incomprehensible "threat factors"

In an overview [9], ABC assigns various products and markings so-called "threat factors". We assume that this should describe the (reduced) risk of collision. The term is also used by providers of products aimed at reducing bird collision. While manufacturers use this term to refer to the ratio of flights towards the reference pane in the flight tunnel in percent, ranging between 50 (chance) and 100, the "threat factor" values used by ABC range from 0 to 100 (clear glass = 100). Thus, these values should not be used to reflect the ratio of flights, yet ABC has done just this in many cases of known test results. Furthermore, it is not evident where these values come from, whether they are based on own or on third-party testing, and whether they are values from test situations for transparency or specular reflection.

Final conclusion

The tests and recommendations of ABC are unclear and incomprehensible to us in many points. In the interest of the birds, we recommend adhering to the proven methods and recommendations summarised in the brochure "Bird-Friendly Building with Glass and Light" [4].

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