Short communications - Rövid közlemények

Visual deception of a Great White Egret by shiny plastic sheets

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Several years after the end of the Gulf War in 1991 many crude oil lakes still existed in the desert of Kuwait (Pearce 1995). These lakes were formed when oil wells and pipelines were blasted and the resulting spills were subsequently accumulated in more than 900 oil ponds. These oil lakes trapped thousands of birds, especially those species that are associated with water (Pilcher & Sexton 1993, Horváth & Zeil 1996). Similar phenomenon was observed in the waste oil lake in Budapest, Hungary (Horváth *et al.* 1998).

At warm weather the surface of these lakes is flat and shiny and it acts as an efficient reflector, like a water surface. It is pertinent to suppose that the deceiving capability and attractiveness of these oil lakes may be explained by their shiny surface. Birds may be deceived by the reflected light which may imitate the glitter of a water surface. Thus, we hypothesized, the birds might mistake the oil for water.

Our hypothesis was that water birds may be attracted to the oil lakes by the bright reflection of light. Such smooth, shiny surfaces may mimic water and thus attract water birds. The optical cue of these shiny surfaces may be so strong that birds are visually compelled to remain in the immediate vicinity of the lakes in spite of the fact that other senses signal that these are not water.

To test this hypothesis, we performed a choice experiment with a Great White Egret (*Egretta alba*) in the field. We imitated a crude oil lake or a wet muddy surface by means of a huge shiny black plastic sheet laid onto the ground, while a brighter water was mimicked by a shiny white plastic sheet. We observed the reactions of an egret to these plastic sheets. Our main aim was to learn whether an egret, as a typical bird associated with water, can be deceived by and lured to such plastic sheets in its natural habitat. If yes, which sheet is preferred by it, and how does it respond to these dummies.

From 2 to 14 August 1997 a choice experiment was performed in the field at Kunfehértó (46° 23' N, 19° 24' E), a village in the southern part of the Hungarian Great Plane. Two huge plastic (polyethylene) sheets measuring 20 m x 30 m were laid on the ground in a large alkaline field at about 500 m from a lake where a Great White Egret (*Egretta alba*) lived. Such plastic sheets are commonly used in agriculture. One of the sheets was black and the other milky translucent. Due to the greenhouse effect the lower surface of the latter dimmed in some minutes following

Tab. 1. The behaviour of a Great White Egret (*Egretta alba*) at the white and black plastic sheets during the choice experiment from 2 to 14 August 1997.

BEHAVIOUR OF THE EGRET ON THE PLASTIC SHEETS	TIME (day, hour:minute)	WEATHER
landing next to the white plastic at a distance of 3 m; flying away in a few minutes	05, 17:39	sunny, calm, clear sky
landing beside the white plastic; approaching it at a distance of 1 m; flying away	06, 09:07	sunny, calm, clear sky
landing next to the white plastic; walking to it; stepping onto its edge; flying away in some minutes	07, 17:00	sunny, breeze, clouded sky
TRANSPOSITION OF THE PLASTIC SHEETS	08	
17:36 - landing next to the white plastic and stepping onto it; walking about; striking off with the bill; looking for prey; 'fishing'; gazing at the plastic bowed down; looking around with head high up 17:46 - reaching the edge of the white plastic; crossing the grass between the plastics; walking to the black plastic 17:48 - stepping onto the black plastic; walking about; neck and head being usually high up; crossing fast the plastic 17:51 - reaching the edge of the black plastic; standing about on the grass; pluming; looking around 17:58 - flying away	09, 17:36-17:58	sunny, breeze, clouded sky
18:03 - landing next to the white plastic and stepping onto it; walking about; picking the plastic with the bill; standing about; watching; pluming; resting 18:33 - sitting down; standing up; standing about; defecating 19:25 - flying to the black plastic; walking about; picking the plastic with the bill 19:32 - flying away	11, 18:03-19:32	sunny, calm, clear sky

unfolding. Because the billions of tiny water drops (vapour) scattered the incident light diffusely the plastic sheet became brilliant white.

The distance between the plastic sheets was 30 m. In the first half of the choice experiment the white plastic sheet was closer to the lake, and in the second half of the experiment the two sheets were transposed with each other. The vegetation beneath the sheets was mown. The sheets were streched out horizontally as tight as possible, and they were pinned down by bricks at the edges. Because of wind-generated wrinkles and thermal dilatation in sunshine the surface of the sheets became sometimes uneven, which was compensated by repeated spanning of the sheets at sunrise, noon and sunset. This spanning did not disturb the observed bird, because it always rested at these hours in the surrounding vegetation.

During the experiment we observed a Great White Egret attracted to the plastic sheets from a hide at a distance of 30 m from both sheets. This distance was large enough not to trouble the observed bird, and small enough to ensure the visual inspection of possible prey animals on the plastic sheets. Although we did not marked the observed bird, we were convinced that always the same egret landed on the plastic sheets, because during our choice experiment only a single Great White Egret stayed in the habitat. The observation lasted every day from 05:00 to 20:00 hours by changing the observers over at noon. Using a telescope (Kowa TSN, x60 zoom), we checked both plastic sheets continuously looking for possible preys (e.g. insects, lizards or frogs) available for egrets. We could observe that there were not any such animals on the plastics during the time the egret walked

on them. From 40-50 m with our telescope we could observe any object not smaller than about 1 cm on the plastic sheets.

In earlier studies, the optical characteristics (brightness, colour, degree and direction of polarization) of the black and white plastic sheets (Horváth & Pomozi 1997, Horváth *et al.* 1998, Kriska *et al.* 1998) used in the choice experiment were measured and compared with those of crude oil lakes (Horváth & Zeil 1996, Horváth *et al.* 1998) and natural water bodies (Schwind & Horváth 1993, Horváth 1995, Horváth & Varjú 1997, Horváth *et al.* 1998, Kriska *et al.* 1998). On the basis of these measurements we could establish the following: (1) The optical characteristics of the shiny black plastic sheet are practically the same as those of (i) wet, marshy soil; (ii) dark, deep water bodies; or (iii) black crude oil surfaces. (2) The optical characteristics of the shiny white plastic sheet are very similar to those of (iv) bright-bottomed shallow clear water bodies; or (v) turbid white (e.g. alkaline) water. Hence, the white plastic sheet used in our choice experiment mimicked clear water with bright bottom or white and turbid water, while the black plastic sheet imitated some kind of black and wet mud, or black crude oil surfaces.

We observed a Great White Egret to return five times to the white plastic sheet and land three times on it whereas it stepped and walked on the black sheet twice. The reactions of the egret to the plastic sheets are summarized in Tab. 1. The egret always flew to the white plastic sheet. After landing at the edge of the white plastic, it stepped onto the sheet, where it stood or walked about, frequently picked the plastic or stroke off with its bill, plumed itself, rested, watched, sought for prey, "fished", gazed at the white surface with its neck bowed down, looked around, defecated, or even sat down. In spite of any tactile, olfactorial or thermal experience the egret behaved quite similarly on both of the plastics as at real water surfaces (Hancock & Elliott, 1978; Hancock & Kushlan, 1984).

The egret was apparently deceived, because we heard and saw that it pecked at the plastic sheet. Once, "fishing" on the white plastic and reaching its edge the egret took a short cut across the field between the plastic sheets towards the black plastic and stepped onto it. It walked about on the black plastic for some minutes while gazed at the dark surface, sometimes stroke off or "fished", however, it crossed the plastic rather quickly. When the bird reached the edge of the black plastic sheet it began to preen on the grass, and finally flew away.

After transposing the black and white plastic sheets, the egret landed twice again first on the white plastic sheet. It is remarkable that once the bird stayed for 1.5 hours on the white plastic, and showed the same reactions and behaviour elements as earlier. Thereafter the bird visited the black plastic sheet for some minutes, and then flew away (Table 1).

Since we did not see any prey animal on the plastic sheets during the time the egret walked on them, the attractiveness of the plastics can be explained only by visual cues. The reactions to the plastic sheets of the egret might be explained in such a way that egrets often forage in shallow water where they can fish and catch prey. Shallow waters are usually brighter than deeper ones. Wading birds rarely fish in deeper, that is, darker waters (Hancock &

Elliott, 1978; Hancock & Kushlan, 1984). The five visits of the egret at the plastic sheets, especially its sojourn of 90 minutes in one of the five occasions on the white plastic convinced us of its keen interest aroused and captivated by the plastics. The behaviour of the egret demonstrated that the bird was probably deceived by the water-imitating optical cues of the white plastic sheet, and the bird undoubtedly mistaked the white plastic sheet for water in spite of the fact that the other characteristics (temperature, smell, mechanical properties, etc.) were quite different from those of real water.

Because only the optical characteristics of the plastic sheets were approximately common with those of real water, the egret was probably attracted to the plastic by the reflection of light. This optical cue was strong enough to strain the egret to react upon the plastic dummies quite similarly as upon natural waters (Hancock & Elliott, 1978; Hancock & Kushlan, 1984). This observation is important, because it may explain how crude oil lakes attract egrets and other wading birds. We propose that the deceiving capability and attractiveness of these oil lakes to egrets (and other water-seeking birds) may be explained by the shiny appearance of their surface. These birds might be deceived by the reflected light, which may imitate them the glitter of a water surface.

The egret observed in our choice experiment seemed to prefer the white plastic sheet against the black one. From this we may conclude that the water-specific behaviour might have been elicited in the observed bird by phototaxis. In our opinion, the light reflected from the flat surface of oil lakes and tar seeps could deceive and lure water-seeking birds similarly. These birds may mistake the shiny oil surfaces for water or wet mud. We suggest that after landing at an oil lake and probing the oil birds may recognize that the warm, black, non-transparent, sticky and smelly oil is not water, however, the light reflected by the oil surface is a so strong visual cue that it elicits water-specific responses.

It would be important to investigate further the visual ecologic impacts of oil lakes to the avifauna in detail, because only on the basis of such studies can be explained the enigmatic attractiveness of oil reservoires to birds. These studies are the basis of the necessary environmental protective measures that should be urgently taken in order to eliminate any natural tar seeps or man-made oil spills which are so dangerous to birds, especially to those associated with water.

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Összefoglalás

Hogyan tévesztett meg egy nagykócsagot egy fekete és egy fehér csillogó műanyag fólia?

Tanulmányunkban arról számolunk be, hogy miként tévesztett meg vizuálisan egy nagykócsagot (*Egretta alba*) egy fehér és egy fekete, 20 m x 30 m-es műanyag fólia, amelyeket 1997 augusztusában terítettünk ki egy mezőre a délalföldi Kunfehértó kiszáradt szikes tavának egykori medrében. A nagykócsagot a fóliák többször is magukhoz vonzották. A madár viselkedése igen hasonlított a nagykócsagok valódi vizeknél mutatott viselkedéséhez. A madár a fehér fóliát részesítette előnyben a feketével szemben. Értelmezésünk szerint miután a madár leszállt a fóliákhoz és rájuk ment, észlelhette, hogy nem vízzel van dolga, de a fényes, sima felszínű fóliák által visszavert fény olyan erős vizuális jelnek számíthatott, hogy a madárból vízspecifikus viselkedési elemeket válthatott ki.

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