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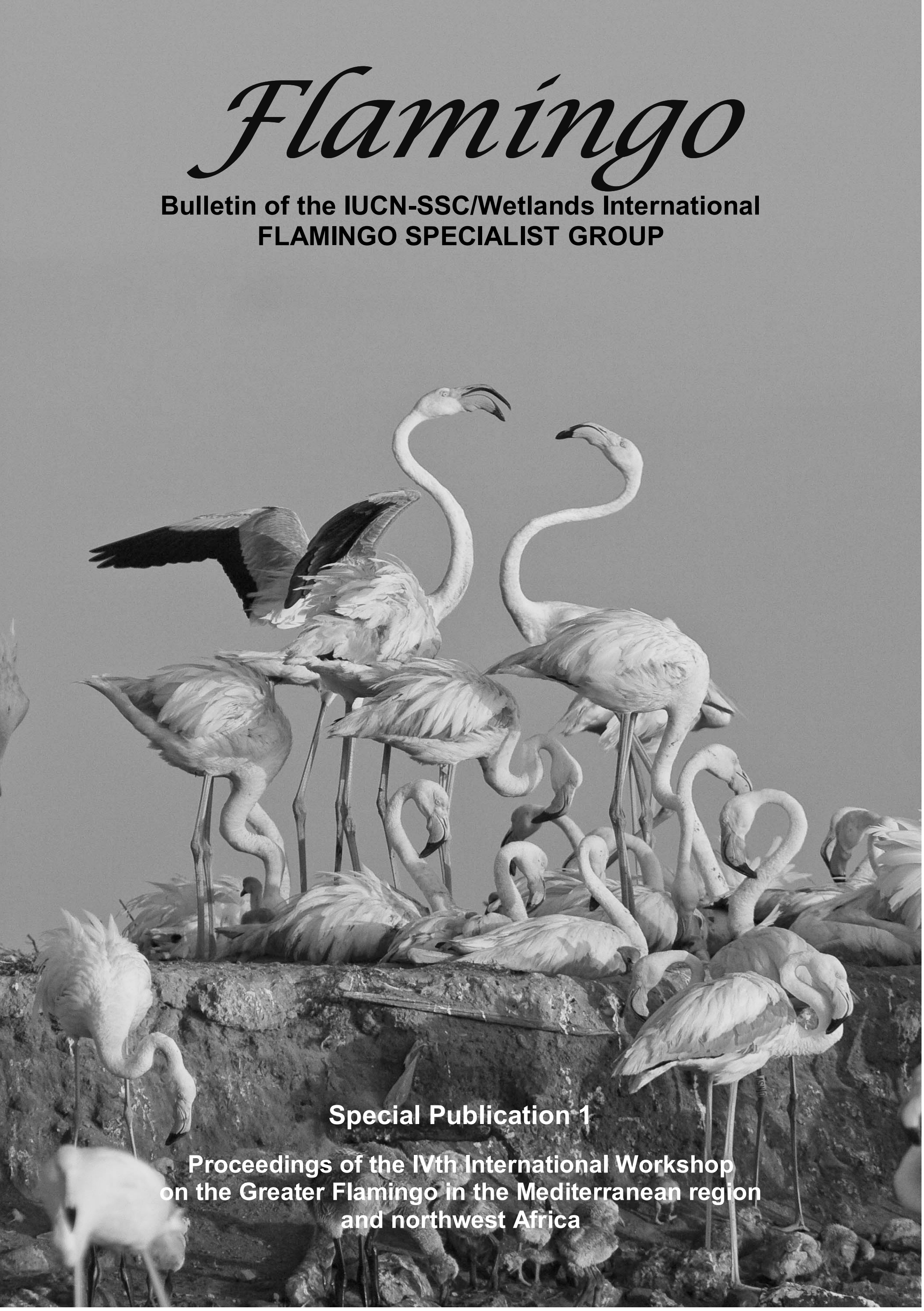

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Which ring colour looks best: results of the Antequera 'ophtalmic' tests

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Abstract
Accurate reading of ring codes is a critical assumption of capture-mark-resighting studies. However, the effects of the different ring characteristics on reading accuracy in the field have not received the attention they deserve. Here we present the results of a very preliminary field test on the performance of a panel of flamingo experts in correctly recording varied sets of colour rings placed at increasing distances on the mudflats of the Fuente de Piedra lagoon. Mistakes occurred most often on dark rings, yellow ones performing best.

Introduction
The correct recording of individual codes that are engraved on colour-rings is of crucial importance in the study of flamingos and marked birds in general. 'Un-recording' colour-marked birds, because of the loss of their marks is frequently acknowledged as a source of bias in studies of bird demography (e.g. Pistorius *et al.* 2007). Mark loss, however, is the very final stage of a process of mark ageing, during which fading and partial breaking are likely to increasingly cause wrong records that seem even more dangerous, as each incorrect record affects two individuals, instead of only one (i.e. one bird that is locally present, whose code is missed, and one that is probably absent, whose code is recorded by mistake).

Plastic quality, strictly related to mark durability, is one of the causes of possible misidentification as a colour ring ages. A number of other variables, however, affect the recording performance even when a ring is new (*e.g.* colour, size and type of code, and many more subtle differences). The effects of ring characteristics on reading accuracy in the field have not received the attention they deserve (see Mitchell and Trinder 2008, and references therein). When starting a new colour ringing project, the ring characteristics are usually selected in terms of common sense, what might well work properly until ringers are few and available combinations many. 'Project overcrowding' of some species (see www.cr-birding.be) or very long-running projects may now strongly constrain the choice and lead to sub-optimal solutions.

The gathering of many experienced 'flamingo-readers' at this workshop in Antequera, Spain was an opportunity to attempt a preliminary field test on their performances in correctly recording varied sets of colour rings at increasing distances on the mudflats of Fuente de Piedra lagoon.

(Human) material and methods
The rings used were the usual size for Greater Flamingos Phoenicopterus roseus (55 mm long with 19 mm inner diameter). They had been purposely produced by ProTouch (Canada) in five different colours with 4-letter codes engraved three times (black codes on white and yellow rings, white codes on blue, green and black rings). The same 15 letters (A B C D F H J K L N P S T V Z) that are used In Italy on wild Greater Flamingos *Phoenicopterus roseus* were randomly present in the codes, each letter being c. 19 mm high and engraved by a 3 mm point. The red colour was not tested, as it was judged to offer not enough contrast with adult flamingos' legs.

Experimental design
Five sticks holding 10 rings (two each of the five colours) were fixed in the solid mud at 50 m intervals, 200 m to 400 m from the observers' position. Only 14 participants could be tested, due to failing light conditions, and not all of them had time to check all sticks. Each observer dictated the colour and code combinations to another person who recorded them on a standard form. Our aim was to test only: i) the accuracy of colour identification and ii) the accuracy of code reading by ring colour. On checking the forms, cases of wrongly identified colours were considered as individual mistakes for the first test, while partial readings and wrong readings (e.g. containing at least one incorrect letter) were both counted as individual mistakes and summed up according to the respective ring colour (second test).

Results

Identification of colours

Most ring colours were correctly identified (Table 1). Very few mistakes were recorded in the case of green, white, black and yellow, while several blue rings were noted as black (but not the reverse).

Table 1. Number of times a given ring was said to be of a given a colour depending on its real colour

	Number of detection as				
Real colour	**green**	**blue**	**white**	**black**	**yellow**
green	102	1	0	1	0
blue	1	92	0	1	0
white	1	0	114	0	2
black	1	21	0	115	0
yellow	0	0	0	0	115

Accuracy of code reading according to ring colour

Table 2 shows first, the percentage of codes that were read correctly (for each colour), and then the sample size (how many rings of each colours were examined by the participants). Mistakes occurred most often on black rings, yellow ones performing best.

Table 2. Percentage of correct reading of ring code by ring colour

Colour	% correct	N
Yellow	91.1	123
White	89.3	121
Green	75.4	129
Blue	75.2	126
Black	69.8	129

Discussion

No statistical analysis was done of these results, because the sample size was small and the test itself very preliminary. Nevertheless, some useful indications are apparent and usually confirm Mitchell and Trinder's (2008) findings, with a few differences: blue being correctly identified as often as the other colours in their case, but being at the same time the colour that accounted for most misread codes, instead of black. The reason for these differences might be either in the shade/brightness of each ring colour used in the two experiments, or to fading light conditions during the Antequera test, or in ambiguous notations on some field sheets (BL abbreviation used for black or blue), all these being possible sources of variability that were not controlled.

There are many other aspects that could be analysed in this way (*e.g.* the effects of distance, and the legibility of the 15 letters). We plan to organize a similar test on the Italian observers' network, taking full advantage from the Antequera trial.

Acknowledgments

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References

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