

Are garters attractive and why? A case study in the Moorhen (*Gallinula chloropus*)

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Abstract - Garters are important elements in moorhen morphology: they are orange-red bands above tibial joint, whose size and colour intensity vary in throughout the year. We tested the hypothesis that garters are important in parental communication. In open field experiments we found that moorhen chicks showed evident preferences for decoys with garters, and we discuss these findings in the light of some aspects of moorhen behavioural ecology.

Introduction

Garters are interesting elements in moorhen (*Gallinula chloropus*) adult morphology. They are orange-red bands above tibial joint, whose size and colour intensity vary during the year (Cramp and Simmons 1980; pers. obs.). In the non-breeding season, garters are brownish and unevident, while in the breeding period they become intensely red coloured and wider. These elements occur in some species of *Gallinula* and in other rails (Ripley 1977). In birds, colours such as the yellow, orange and red in feathers, bill and head ornaments (wattles, combs, shields) are mostly produced mostly by carotenoids. Carotenoids are terpenic pigments that cannot be synthesized by animals and must be assimilated with food. There are many evidences that carotenoid-based ornaments have a real cost for the organism (Hill 1996; Olson and Owens 1998): they represent a limited resource that animals could allocate optimally between physiological-immunocompetence functions and pigmentation (Hill 1990; Figuerola *et al.* 1999; Fenoglio *et al.* 2001, 2002).

The fact that garters are likely to be costly elements, and that their size varies during the year, suggests that these elements might have evolved under ecological pressures and, hence, have some significance. Our hypothesis is that garters serve in adult-chick communication. In this study we tested whether garters are attractive for chicks, discussing our findings on in the light of moorhen behavioural ecology.

Methods

Moorhen clutches were collected in mid-May 2001 from recently deserted natural nests in the open-to-visitors area of the Stork and Wildflow Centre of Cascina Stramiano, Racconigi (NW Italy). The collected eggs were put in an incubator until hatching. After hatching, 20 chicks were raised together in a heated aviary, under the same environmental conditions and stresses. Each chick was marked with a coloured ring for individual recognition.

When the chicks were 2, 4, 6, 8, 10 days old, they were subjected to a behavioural test. Each chick was placed separately in an enclosed fenced chequered area (1.5 m * 1.5 m; each square = 10 cm). Then, we presented in turn a decoy with red ringed legs, in simulating garters, and one without. The decoys were made of textile and wood and presented the same colour patterns of adult moorhens. Decoys were presented in random order. We moved the decoy in a standard way for 5 minutes and measured chick response. A hidden observer and a videocamera followed the path of the chick response index was calculated as the number of squares visited. All observations were made in the morning, from 8.00 to 9.00.

Results

We tested 20 chicks in five occasions. At all ages, moorhen chicks showed a significant preference for

the decoy with red garters (Tab. 1). Furthermore, we detected an evident increase of the stimulus attraction in the first period and a successive reduction; after 10 days we stopped the test because decoys resulted little or no attractive; this pattern was found for both control and red-banded decoys (Fig. 1).

Discussion

We detected an evident preference for red-gartered legs of decoys: despite a general tendency to track objects in movement, chicks followed more easily the imitation with red garters.

Tab. 1. Chicks response to control and red-gartered decoys (mean number of squares travelled)

Age	Red garter (Mean \pm SD)	Control (Mean \pm SD)	t	p
2	2.750 \pm 1.372	1.000 \pm 0.725	5.705	0.001 ***
4	3.600 \pm 1.465	1.750 \pm 0.851	6.132	0.001 ***
6	3.950 \pm 1.731	1.750 \pm 1.446	5.082	0.001 ***
8	3.250 \pm 1.682	1.600 \pm 0.940	4.931	0.001 ***
10	1.250 \pm 1.164	0.600 \pm 0.754	3.115	0.006 ***

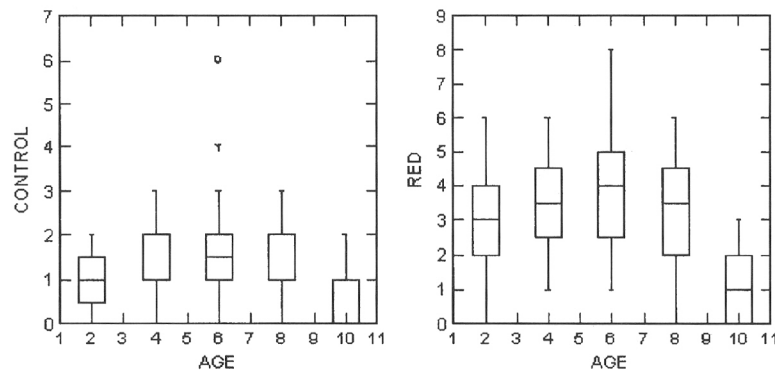


Fig. 1. Chick response over time (Control = control decoy, Red = red gartered decoy).

Moorhens chicks are precocial and nidifugous. They leave the nest after 1-2 days, when they start following their parents. They are totally dependent on adults for 7-10 days and become self-feeding at 21-25 days (Taylor and van Perlo 1998). We suppose that in precocial species, as rails, the risk of chicks dispersion is high, so evolutionary pressures can have originated signalling structures that allow chicks to maintain a close contact with their parents. This exigency is particularly evident in species that live in highly fragmented environments, such as reed or riparian vegetation of ponds and swamps. Our hypothesis is that red garters can achieve the function of advertising parents' location, and so minimising the risk of brood dispersion. Garters might occur in both sexes because moorhens are monomorphic and monogamous, and because both sexes participate in parental care and chick feedings (Taylor and van Perlo 1998; pers. obs).

In birds, it is known that chromatic displays play an important role in parent-offspring interactions and it is evident that chick begging in some species is driven by certain colour patterns (Tinbergen and Perdeck 1950, Lyon *et al.* 1994). Newly hatched moorhens present a typical begging posture and show a pecking response and a colour preference for red or yellow rather than green, blue-green or blue (Weidmann 1965; Kear 1965). We suppose that garters could have evolved as imitation of the frontal chromatic display: chicks are used to receive food from the red bill of adults and so they react positively to this colour; they look for and actively follow red spots in the environment, keeping the contact with their parents. In conclusion, we present some evidences that garters could have evolved to aid chicks to locate parents in dense vegetation.

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Riassunto - Le giarrettiere o garters sono un interessante elemento nella morfologia della Gallinella d'acqua: si tratta di anelli rosso-arancio posti sopra la giuntura tibiale, presenti negli adulti di entrambi i sessi. Considerando il fatto che sono segnali costosi, derivanti dalla deposizione di carotenoidi, e che è evidente una loro notevole variazione durante l'anno (sia nelle dimensioni sia nella colorazione) abbiamo ipotizzato che tali elementi debbano essersi evoluti sotto la spinta di precise pressioni evolutive. Scopo del nostro lavoro è stato testare l'importanza delle giarrettiere nella comunicazione parentale. In condizioni sperimentali, abbiamo evidenziato che i pulli di questa specie mostrano una significativa preferenza nel seguire zimbelli dotati di anelli rossi sulle zampe. Abbiamo quindi discusso questo risultato, sottolineando la potenziale importanza di segnali parentali in specie precoci e caratteristiche di ambienti con una bassa visibilità, come canneti e tratti boscati perifericali.

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