

THE FUNCTION OF THE FEMALE'S SKY-DANCING IN THE MONTAGU'S HARRIER IN NATURAL HABITATS OF EASTERN POLAND

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Abstract. Most of authors describing courtship behaviour in birds concentrate on the male behaviour. In opposite to majority of ornithological literature, this study focus on the female courtship behaviour observed in the Montagu's Harrier population breeding in the natural habitat of eastern Poland. This paper is an examination of the meaning and behavioural context of the female's sky-dancing. Female displays in the time of courtship can stimulate males to more intensive food provisioning and support their pair bonds. Despite this situation when male is present in the territory, female's sky-dancing can be a proposition for other males as possibility obtaining of extra food for extra-pair copulations when male is absent. Sky-dancing may also be a non aggressive displays to territorial behaviour against to other female from neighborhood.

Key words: Poland, Montagu's Harrier, *Circus pygargus*, reproductive behaviour, display, sky-dancing.

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Функция воздушных танцев самок лугового луны в естественных биотопах Восточной Польши. - Я. Вёнецк. - Беркут. 16 (2). 2007. - Большинство авторов, описывающих ухаживание у птиц, концентрируются на поведении самцов. В этой статье внимание фокусируется на поведении самок лугового луны. Воздушные танцы луней исследовались на известняковых болотах возле г. Хелм на востоке Польши в 1992–1995 гг. Предполагается, что демонстрации самки стимулируют самца к более интенсивному предложению пищи и поддерживают связи в паре. При отсутствии самца на гнездовой территории эти демонстрации могут быть обращены к другим самцам. Воздушные танцы могут быть также неагрессивными демонстрациями при защите территории от других самок.

Introduction

Mate choice is a basic problem in the life cycle in many species of animals. In different groups of vertebrates many traits of advertising are used. Fishes, amphibians, reptiles, birds and mammals have a specific signals to advertise their quality (Kodric-Brown, Brown, 1984). The main goal of this behaviour is a choice of the partner in high genetic quality. But mate choice can be also focused on direct benefits, not just genetic quality (Andersson, 1994).

These phenotypic cues or special kind of behaviour must be energetically costly and difficult to fake to be useful in selecting high quality males, but only if courtship is honest signal of mate quality (Simmons, 1988, 2000). Among birds of prey only harriers (*Circus* sp.) perform special kinds of aerial displays described in literature as sky-dancing (Clarke, 1996; Simmons, 2000; Arroyo et al., 2004). In the Montagu's Harrier (*Circus pygargus*)

the both sexes perform these high energetic costly displays (Cramp, Simmons, 1980; Clarke, 1996; Wiącek, 2004). However, these aerial displays are more often observed in males of Montagu's Harrier than females (Arroyo et al., 2004; Wiącek, 2004, 2006). The aerial displays in this species of bird of prey are elements of honest advertising. Males in better condition display more intensively than males in poor condition. More frequent displaying males are preferred by females (Wiącek, 2004). Similar behaviour has been described in other species of harriers (Simmons, 2000). But all authors underlined that sky-dancing observed in females is not as vigorous as in the males (Clarke, 1996; Simmons 2000; Arroyo et al., 2004; Wiącek, 2004). Females after exhausting migration arrive on the breeding grounds and begin clutch formation. This costly energy process can exclude intensive courtship behaviour as sky-dancing, however some females start begin performing displays. Generally data about female's sky-danc-



ing in the harrier's literature are rudimentary and scarce (Baker-Gabb, 1981). Most of authors focused on male behaviour and its role in the time of courtship (Simmons, 1988; Pandolfi, Barocci, 1994; Wiącek, 1998, 2004, 2006). Therefore question the occurrence the female's sky-dancing in the time of pair-formation to be worthy of notice.

The aim of this work was to describe and define behavioural function of the sky-dancing in the females of Montagu's Harrier.

Study area and methods

From 1992 to 1995 sky-dancing of 23 females of Montagu's Harrier were observed in Special Protection Area for birds within Nature 2000 network near Chełm in eastern Poland (51°10' N, 23°37' E). The birds were monitored in the Nature Reserve "Bagno Serebryskie" (Fig.1). The study area was 376 ha (Sidło et al., 2004). The Sedge (*Cladietum marisci*) is the dominant vegetation type (*Cladium mariscus* dominant). The study area was surrounded by agriculture landscape. Over the study years, 11 from all 23 observed females were caught in special ornithological nets (Busse, 2000) using Eagle Owl (*Bubo bubo*) as a decoy. These birds were ringed and individually marked using special coloured wing tags (Kochert et al., 1983). The colour markers did not modify the harriers behaviour. Some unmarked individuals were individually recognized by differences in their plumage and the moulting stage (gapes in primaries, secondaries or tail feathers).

Observations started each season between 16th and 20th April after the arrival of harriers at the breeding places. Every day of observations birds were monitored from 7 a.m. to sunset. We recorded first egg laying and hatching dates in the studied pairs through nest visits, as well as number of eggs in each nest and growth rate of nestlings. Nests with fledglings were monitored every week.

Field observations were conducted throughout the pre-laying period, incubation, hatching and nestling periods. The behavioural observations focused on the pre-laying period

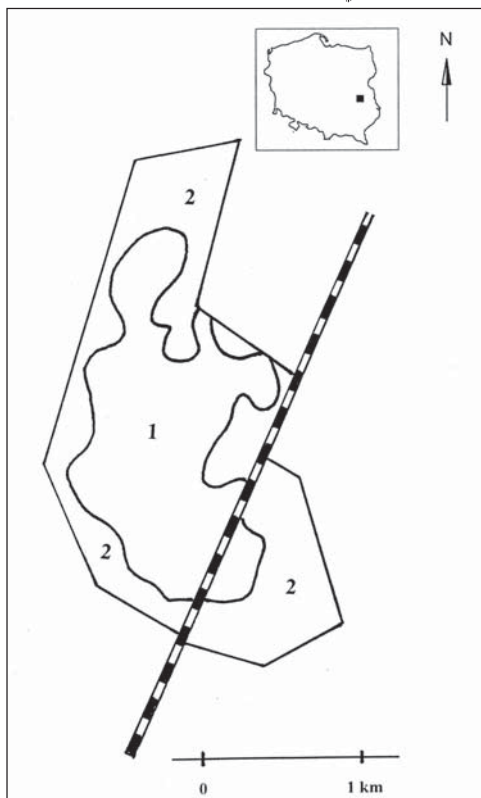


Fig.1 Study area on calcareous marshes near Chełm (1– marshes, 2 – meadows).

Рис. 1. Район исследований на известняковых болотах возле Хелма (1– болота, 2 – луга).

inside harriers territories. Total time of observations in this period was near 800 h. Observations in later periods of the breeding season were conducted mainly while visiting the nest and nestlings until they started to fly. Observations were performed at a distance of 150 m away from nests, using 10 x 50 binocular and a spotting scope 20 x 77. Birds were observed 12 hours a day, from 7 a.m. till sunset. We measured the time of sky-dancing performed by both sexes with an accuracy to 1s (by the use of a stopwatch). The time of food transfers were recorded in the same way.

Analyses were made with nonparametric statistics (Mann-Whitney test, Spearman correlation, test χ^2). All analyses were performed with Statistica 6.1.



Female's sky-dancing in different seasons of observation

Воздушные танцы самок в различные сезоны наблюдений

Study year	Breeding pairs	Observed pairs	Displaying females	Number of sequences	U-shaped evolutions	Evolutions per sequence
1992	11	6	2	7	15	2,1
1993	12	6	4	20	103	5,1
1994	9	6	3	25	89	3,5
1995	6	5	2	18	51	2,8
Total	38	23	11	70	258	mean 3,7

Results

During the field study an aerial displays were observed in both sexes. In the time of sky-dancing males and females performed 2302 U-shaped evolutions. Females performed 11 % of all evolutions while males 89 %. In the time of observation 70 sequences of female displays, contained 258 U-shaped evolutions were observed. The females performed near 15 % sequences of displays (an average 3,7 evolutions per sequence) while males – 85 % (5,4 evolutions per sequence). The difference was not statistically significant ($\chi^2 = 0,31$, $df = 1$, $p < 0,57$). The duration of single evolution in the females during displays was near 6,6 s while 6,3 s in the males ($\chi^2 = 0,007$,

$df = 1$, $p < 0,93$). Every season of observation, different numbers of sky-dancing were monitored (Table). There was a significant differences in the number of evolutions performed by females between following seasons of observations ($\chi^2 = 72,5$, $df = 3$, $p < 0,001$). The sky-dancing was observed only in 11 females (23 total number of monitored females) settled in the clumped territories inside semi-colonies. Female's displays in solitary territories was observed very rare (1 sequence in all season observation) or did not observed at all.

Female's sky-dancing was performed together with partner (70 %), in attendance of rival females (8 %) and in situation when female was alone in the territory – 22 % (Fig. 2).

Sky-dancing was observed in females with low level of courtship feeding. Between courtship feeding and total numbers of sequences of female sky-dancing strong negative relationship was recorded (Spearman correlation: $r = -0,53$, $p = 0,02$, $N = 23$). Female sky-dancing did not provoke males to improve their feeding support.

All displaying females started egg-laying later than others (Mann-Whitney test: $Z = 2,34$, $p = 0,01$, $N = 11$). The duration of the pre-laying period was longer in females with

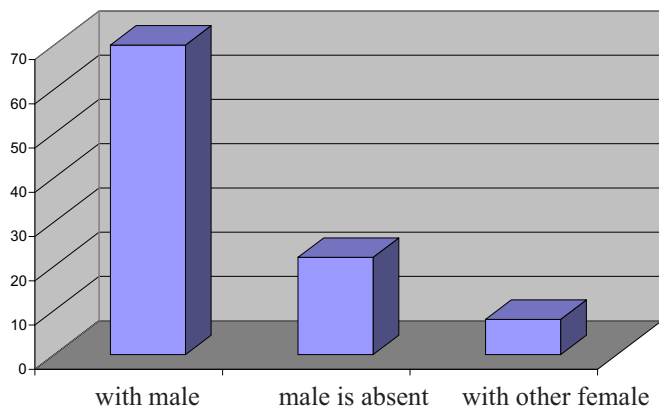


Fig. 2. Female's sky-dancing in different behavioural situations (%).

Рис. 2. Воздушные танцы самок в разных поведенческих ситуациях.



intensive sky-dancing, an average 18,7 days (median = 19, SD = 3,16, N = 11) than in females without displays, an average 16,5 days (median = 16, SD = 2,42, N = 11). But the difference between these values was not statistically significant (Mann-Whitney test $Z = 1,67$, $p = 0,09$, N = 11). More intensive female's sky-dancing was observed in the year 1993 when the biggest number of the breeding pairs in the time of study was recorded (Table). This year was rather poor in food in comparison with two peaks in 1991 and 1995 when availability of the prey (dominant prey *Microtus arvalis*) was much higher (Wiącek, unpubl. data).

In the time of field study only one case of extra-pair copulation (EPC) was observed. The female was mated with individually marked male from neighborhood. Seven observations were noted while male offered a food in other female territory. Food was transferred to female but copulation was not observed.

Discussion

Sky-dancing in harriers is more frequently observed in males than in females. Data described by majority of the authors in literature confirmed this thesis (Schipper, 1978; Cramp, Simmons 1980; Picozzi, 1984; Hamerstrom, 1986; Simmons, 2000). Similar observation, made in the Montagu's Harrier are in agreement with literature cited above (Pandolfi, Barocci, 1994; Arroyo, 1995; Clarke, 1996; Wiącek, 2004). All authors, underlined fact, that males sky-dancing was more vigorously than in females. For heavier females, sky-dancing is energetically costly after spring migration. The eggs production is an additional ballast for female physiology and mobility. Therefore frequently displaying females in the study area started egg-laying later. Good physical condition in the early stages of breeding season is very important criterion underlined by many authors (Newton, Marquiss, 1981; Newton, 1986; Simmons, 1988; Bortolotti, Iko, 1992; Palokangas et al., 1992).

In many species similar as in harrier's females the main way to rebuilding body condi-

tion and start egg-laying was courtship feeding. Better fed females start to eggs laying earlier (Newton, 1979; Dijkstra et al., 1982; Meijer et al., 1989; Wiącek, 1997). In the time of study better supported females performed low sky-dancing or did not display at all. More intensive sky-dancing was observed only in females with low level of courtship feeding. However this behaviour did not improve the level of male's courtship feeding.

Duration and frequency of aerial displays observed in the study area was different in following seasons. Similar conclusions were described in males from different species of harriers (Simmons, 1988, 1990). In harriers as in others displaying birds of prey, more intensive courtship behaviour was observed rather in the seasons rich in the food than poor (Simmons, 2000). Extremely, in poorer in prey seasons a lot of birds did not start to breed at all (Village, 1990; Bortolotti, Iko, 1992). This study show that females, in opposite to males more frequently displayed in poor years (season 1993). Therefore behaviour noted in females in the time of study, especially in poor in food years, indicate that sky-dancing have a quite different behavioural meaning in females than in males. Probably this kind of courtship behaviour observed in females is a form of food begging. Frequency of this behaviour increase in seasons poor in food because females are neglected by their partners. Presented data did not confirm that males improve their provisioning effort in the context of females behaviour. Therefore females behaviour is probably address to others males from neighborhood able to support them an additional food. The price for extra food can be extra-pair copulation described in many species of birds (Birkhead, Moller, 1992; Mougeot et al., 2002; Griffith, Montgomerie, 2003; Tryjanowski, Hromada, 2005; Kampenaers et al., 2006). This hypothesis is confirmed by fact that 22 % of females sky-dancing was performed alone in the territory. In this way females can to obtain double benefits: additional food and possibility to breed with high genetic quality male. This deceiving female behaviour is possibly because harriers usually breeding in semico-



lony. Males spend a lot of time outside territory, in the hunting areas placed a few kilometers from the nest in natural habitats (Schipper, 1977) or till 20 km in the crops colony (Guixe, 2004). This male's behaviour connect with courtship feeding make an easy terms for extra-pair copulations (Arroyo et al., 2004; Wiącek, 2006). Interesting that female's sky-dancing was observed in clumped territories while females from solitary once displaying very rare or at all. Higher density of breeding pairs favour this kind of behaviour because increase possibility of cuckoldry and obtaining of extra food (Arroyo, 1999; Mougeot, 2004; Wiącek, 2008). In the time of observation only one case of extra-pair copulation and seven cases of food transfer in the EPC context to other female were observed. Many authors in harrier's literature confirm that EPC in the Montagu's Harrier and others species from *Circus* genus is a rather rare phenomenon (Simmons, 1990; Arroyo, 1999; Arroyo et al., 2004). Genetic study on the mate fidelity in the small population of Montagu's Harrier in eastern Poland confirm this data (Wiącek, Kozioł, 1997).

Females performed 8 % of displays in response to other females from neighborhood territory. This behaviour suggest a territorial function of this displays, similarly as described by Simmons (1990, 2000) in others species of harriers.

Conclusions

1. Female's sky-dancing is a part of courtship behaviour performed by the pairs. Context of this behaviour is mate choice based on the males honest advertising. The main meaning of this female's displays is behavioural answer to male sky-dancing, because 70 % of females sky-dancing was performed together with her mate. This behaviour supported pair bond.

2. Sky-dancing performed by poor feeding females, when male is absent in the territory can be a signal broadcast by alone female to neighbor males from semi-colony about her standby to mating for extra food (22 % of observed sky-dancing).

3. Female's sky-dancing is a non aggressive signal (territorial function) against potentially rival female from neighborhood, announcement about formed pair and territory occupancy (8 % of female's displays).

REFERENCES

- Andersson M. (1994): Sexual selection. Princeton: Princeton University Press.
- Arroyo B. (1995): Breeding ecology and nest dispersion of Montagu's Harrier *Circus pygargus* in central Spain. - Ph.D Thesis. University of Oxford.
- Arroyo B. (1999): Copulatory behavior of semi-colonial Montagu's harrier *Circus pygargus*. - Condor. 101: 340-346.
- Arroyo B., Garcia J.T., Bretagnolle V. (2004): The Montagu's Harrier. - BWP Update. 6: 41-55.
- Baker-Gabb D.J. (1981): Breeding behaviour and ecology of the australsian harrier *Circus approximans* in the Manawatu-Ringitikei Sand Country, New Zeland. - Notornis. 28: 103-119.
- Birkhead T.R., Moller A.P. (1992): Sperm competition in birds: evolutionary causes and consequences. London: Academic Press.
- Bortolotti G.R., Iko W.M. (1992): Non random pairing in American Kestrels: mate choice versus intra-sexual competition. - Animal Behav. 44: 811-821.
- Busse P. (2000): Bird Station Manual. SE European Bird Migration Network. University of Gdańsk.
- Clarke R. (1996): Montagu's Harrier. Chelmsford: Arlequin Press.
- Cramp S., Simmons K.E.L. (Eds.) (1980): The Birds of the Western Palearctic, the Middle East and North Africa. Oxford: Oxford University Press. 2.
- Dijkstra C., Vuursteen L., Daan S., Masman D. (1982): Clutch size and laying date in the kestrel *Falco tinnunculus*: effect supplementary food. - Ibis. 124: 210-213.
- Griffith S.C., Montgomerie R. (2003): Why do birds engage in extra-pair copulation? - Nature. 422: 833.
- Guixe D. (2004): Territory characteristic, home range size, habitat and prey selection of the Montagu's Harrier in NE Spain. - Intern. Symposium on Ecology and Conservation of Steppe-Land Birds. Abstract Volume. Lleida, Spain.
- Hamerstrom F. (1986): Harrier, hawk of the marshes. Washington, D.C.: Smithsonian Institution Press.
- Kampenaers B., Lanctot R.B., Gill V., Hatch S., Valcu M. (2006): Do females trade copulation for food? An experimental study on kittiwakes *Rissa tridactyla*. - Behav. Ecol. 18 (2): 345-353.
- Kochert M.N., Stenhoof K., Mortish M. (1983): Evaluation of patagial markers for raptors and ravens. - Wildlife Soc. Bull. 11: 271-281.
- Kodrick-Brown A., Brown J.H. (1984): Truth in advertising: the kinds of traits favored by sexual selection. - Amer. Nat. 124: 309-323.
- Meijer T., Masman D., Daan S. (1989): Energetics of reproduction in female kestrel. - Auk. 106: 549-559.



- Mougeot F., Thibault J.-C., Bretagnolle V. (2002): Effects of territorial intrusions, courtship feedings and mate fidelity on the copulation behaviour of the osprey. - *Animal Behav.* 64: 759-769.
- Mougeot F. (2004): Breeding density, cuckoldry risk and copulation behaviour during the fertile period in raptors: a comparative analysis. - *Animal Behav.* 67: 1067-1076.
- Newton I. (1979): *Population Ecology of Raptors*. Berkhamstead, UK: T. & A.D. Poyser.
- Newton I. (1986): *The Sparrowhawk*. Calton, UK: T. & A.D. Poyser.
- Newton I., Marquiss M. (1981): Effect of additional food on laying dates and clutch sizes of Sparrowhawks. - *Ornis Scand.* 12: 224-229.
- Palokangas P., Korpimäki E., Alatalo R.V. (1992): Female choice in the kestrel under different availability of mating options. - *Animal Behav.* 43: 659-665.
- Pandolfi M., Barocci A. (1994): Description of courtship patterns in Montagu's Harrier *Circus pygargus*. - *Ethol. Ecol. & Evol.* 6: 439-440.
- Picozzi N. (1984): Breeding biology of polygynous hen harriers *Circus cyaneus* in Orkney. - *Ornis Scand.* 15: 1-10.
- Schipper W.J.A. (1977): Hunting in three European harriers *Circus sp.* during the breeding season. - *Ardea* 65: 53-72.
- Schipper W.J.A. (1978): A comparison of breeding ecology in three European harriers *Circus sp.* - *Ardea* 66: 77-102.
- Sidło P., Błaszowska B., Chylarecki P. (2004): Important Bird Areas of European Union importance in Poland. Warsaw: OTOP.
- Simmons R. (1988): Honest advertising, sexual selection, courtship displays and body condition of polygynous male harriers. - *Auk* 105: 303-307.
- Simmons R. (1990): Copulation patterns of African Marsh Harrier: evaluating the paternity assurance hypothesis. - *Animal Behav.* 40: 1151-1157.
- Simmons R. (2000): *Harriers of the World*. New York: Oxford University Press.
- Tryjanowski P., Hromada M. (2005): Do males of the great grey shrike, *Lanius excubitor*; trade food for extra-pair copulations? - *Animal Behav.* 69: 529-533.
- Village A. (1990): *The kestrel*. London: T. & A.D. Poyser.
- Wiącek J. (1997): The effect of courtship feeding on the duration of the pre-laying period in Montagu's Harrier. - *Present Perspectives of Ecology*. Lublin: University of M. Curie-Skłodowska.
- Wiącek J. (1998): Ecology of the pre-laying period in the Montagu's Harrier *Circus pygargus* on the Calcareous marshes near Chelm. - Ph. D Thesis. Lublin: University of M. Curie-Skłodowska.
- Wiącek J. (2004): Sky-dancing as an Honest Criterion of Mate Choice in Montagu's Harrier *Circus pygargus*. - *Raptors Worldwide*. Budapest.
- Wiącek J. (2006): Pair formation in the Montagu's Harrier. - *Berkut* 15 (1-2): 151-158.
- Wiącek J. (2008): Benefits and costs of semi-colonial breeding in the Montagu's Harrier *Circus pygargus*. - *Belg. J. Zool.* 138 (1): 36-40.
- Wiącek J., Kozioł P. (1997): An attempt at verification of partner's fidelity in the Montagu's Harrier *Circus pygargus* with use of DNA fingerprinting. - *Not. Orn.* 38 (3): 173-182.

Замітки	Беркут	16	Вип. 2	2007	249
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О НЕОБЫЧНОМ СЛУЧАЕ ГИБЕЛИ СЕРОГО И ДОМАШНИХ ГУСЕЙ

About an unusual case of death of a Greylag and house geese. - I.R. Merzlikin, V.M. Savostyan. - *Berkut* 16 (2). 2007. - Geese have drown dived under ice. [Russian].

11.11.2007 г. в недавно замерзшей старичье поймы р. Сейм в окрестностях с. Желдаки Конотопского р-на Сумской обл. под свежим еще прозрачным льдом охотником был обнаружен труп серого гуся (*Anser anser*). Когда его извлекли оттуда, он оказался совершенно свежим, хорошо упитанным и без каких-либо ран на теле. Желудок был полон травянистой массы. Не исклю-

чена возможность, что гусь, купаясь, нырнул под кромку льда и не смог оттуда выбраться.

Аналогичный случай наблюдал один из авторов 8.11.2005 г. на пруду в с. Горяйтовка Ахтырского р-на Сумской обл. 3 крупных домашних гуся купались в полынье посредине пруда. Лед был абсолютно прозрачным. Ныряя, гуси оказались подо льдом, не смогли оттуда выбраться и задохнулись на глазах у их хозяина.

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