

Behaviour of Mute Swans *Cygnus olor* wintering at a municipal beach in Gdynia, Poland

Knölsvanars Cygnus olor beteende under övervintring på en kommunal strand i Gdynia, Polen

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Abstract

Mute Swan time-activity budget was studied on a municipal beach in two consecutive winter seasons, 2005 and 2006. The major difference between years in activity pattern was that adult swans decreased minimum feeding time, rested less and moved more in 2006. This year air temperatures were lower at the same time as humans provided less bread due to avian influenza fear. Despite higher energy expenditure in 2006, Mute Swans did not

increase the total feeding time, probably because they still met metabolic demands. In 2006 the amount of aggressive attacks (mostly by adults on juveniles) increased.

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Received 11 June 2007, Accepted 19 September 2007, Editor: J. Waldenström

Introduction

Mass feeding by people is one of the key factors regulating the number of Mute Swan *Cygnus olor* and other waterfowl wintering in cities (Nilsson 1975, Avilova & Eremkin 2001). The main food given to waterfowl in parks and on municipal beaches is bread, which is preferred to natural plant material by swans because it is easier to digest and assimilate (Sears 1989). Wintering in densely populated areas leads to habituation to the frequent proximity of people (Józkowicz & Górska-Klęk 1996, Luniak 2004). The feeding behaviour of birds in urban areas is adjusted to human customs and is aimed at finding or receiving human food (Luniak 2004). When feeding by humans decreases, Mute Swans are known to adjust their behaviour by increasing their aggressiveness and intensity in begging for bread (Sears 1989). The availability of bread provided by humans strongly influences their daily time budget because due to high energetic value of this kind of food, they spent less time foraging (Sears 1989, Józkowicz & Górska-Klęk 1996). Quantitative data on behaviour and time budgets of waterbirds staying within urban areas are still sparse and are related mainly to breeding season (Jędraszko-Dąbrowska 1990, Luniak 2004, Kelcey and Rheinwald 2005).

In this paper the behaviour of Mute Swans wintering at a municipal beach was described with particular focus on feeding and intraspecific aggression.

Study area

The study was conducted in Gdynia city (54°30' N, 18°32' E) on a small municipal sandy beach near the yacht harbour. The seawalls of the harbour were overgrown by water plants, mainly algae. This place is visited regularly by people who often feed wintering birds, throwing small pieces of bread towards birds. The significance of municipal beaches for Mute Swans increases in harsh winters when many shallow water areas freeze and hundreds of birds move to urban areas in search for food (Meissner 1993).

Materials and methods

Each year we observed swans on nine different days that were as evenly distributed between the beginning of January and the end of February as possible. Observations were conducted between 8:00 and 16:00 on days free from precipitation and strong winds from a distance of 30–50m. To our knowledge the presence of observers did not

influence the birds' behaviour. We used the focal sampling method (Altman 1974). Each observation session started with the choice of a focal individual by selecting a random number from random number series generated by computer and counting the number of individuals alternatively from the left and right sides of the flock. The focal individual was then observed continuously for 3 minutes and its behaviour was recorded on the tape recorder. The age of the bird was noted. However, juveniles were omitted in all analyses, except in those of intraspecific aggression, due to their small number. In 2005 we collected data on behaviour of adult birds for a total of 810 minutes and in 2006 for 822 minutes. At night Mute Swans showed no activity and all birds stayed inactive in the study area, which was checked six times during the study.

We assigned behaviour into one out of four categories: feeding, locomotion (walking and swimming), comfort activities (preening, bathing and resting) and aggression. During feeding we noted the type of food: as either natural (mainly water plants taken from bottom or concrete seawall of the yacht harbour) or provided by humans (mainly bread). Begging for food from humans was included in feeding activities. Two categories of aggression were recognised: threatening (when one bird approached another with neck arched) and pecking (when one swan pecked or caught the other with bill).

During observations we also noted the number of strollers, dogs and people feeding birds, because they may have influenced the behaviour of the birds. Temperature was measured daily within the whole studied period (beginning of January – end of February) at 7 am at a place situated 25 km from the study area. All statistical procedures followed Zar (1996).

Results

The mean number of adult Mute Swans in 2005 was 29.7 birds, whereas in 2006 it was significantly higher reaching 45.6 birds (t -test, $t=9.16$, $df=214$, $p<0.0001$). Juveniles were less numerous and in the first and in the second season their mean number was 5.3 and 6.9 birds respectively (t -test, $t=3.11$, $df=178$, $p<0.002$).

Differences between seasons in wintering conditions for Mute Swans

The mean air temperature within the studied period in 2005 was $+0.3^{\circ}\text{C}$ ($N=59$, $SD=4.7$) whereas it was significantly lower in 2006, -4.3°C ($N=59$,

$SD=6.1$) (t -test, $t=4.61$, $df=116$, $p<0.001$). The period of the harshest weather conditions took place between 17 and 25 January 2006, when the temperatures dropped below -12°C .

In January 2006 avian influenza was noted in several sites in Europe and the Mute Swan was the most common victim of this outbreak (Sabirovic et al. 2006). On 12 February 2006 it was announced that in the one of Polish cities two Mute Swans died due to HPAI H5N1 infection. As a consequence of this the other birds from this flock were captured and kept in an aviary. Avian influenza was widely discussed in media and many people stopped feeding waterfowl, because of fear of the transmission of this disease. Despite this, the daily mean number of people visiting the municipal beach was significantly higher in the second season (t -test, $t=3.76$, $df=214$, $p=0.0002$). In 2005 43% of the visitors provided bread to the swans whereas only 17% did this in 2006 (χ^2 -test, $\chi^2=42.92$, $df=1$, $p<0.0001$). There was no significant difference between years in the number of dogs recorded in the study area (t -test, $t=1.14$, $df=214$, $p=0.22$).

Activity patterns of birds

More people visited the beach in Sundays than during other days, but we found no difference in Mute Swans behaviour between weekdays and Sundays (χ^2 -test, $p>0.05$ in all cases) and we pooled data from all days of the week in both seasons.

Mean percentage of time spending on different activities by adult birds differed significantly between years (G -test, $G=28.43$, $df=3$, $p<0.0001$). In 2005 Mute Swans spent 23.0% of their time feeding and 48.8% resting whereas in 2006 they spent 16.7% and 43.3% feeding and resting, respectively. In 2006 they spent more time on locomotion (39.2%) than in 2005 (27.3%) (Figure 1). The percentage of time spent on activities connected with foraging was also different between years (G -test, $G=15.93$, $df=2$, $p=0.0004$). In 2005 birds fed more on bread (79.7% in 2005 and 59.4% in 2006) (G -test, $G=359.0$, $df=1$, $p<0.001$) and less on water plants than in 2006 (10.7% in 2005 and 19.1% in 2006) (G -test, $G=17.0$, $df=1$, $p<0.001$). In 2006 mute swans spent much more time begging than in the 2005 (9.6% and 21.5% respectively) (G -test, $G=101.8$, $df=1$, $p<0.001$) (Figure 2).

Aggression

Aggression by pecking was more common in 2006 than in 2005 (χ^2 -test, $\chi^2=17.17$, $df=1$, $p<0.0001$)

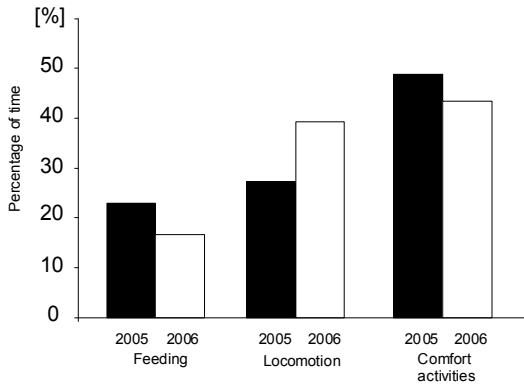


Figure 1. Percent of time spent on main types of activities by adult Mute Swans wintering on a municipal beach, Gdynia in Poland, in two seasons.

Procent tid med olika huvudaktiviteter (från vänster till höger: födosök, förflyttningar och vila) hos knölsvanar som övervintrade två olika år på en kommunal strand vid Gdynia, Polen.

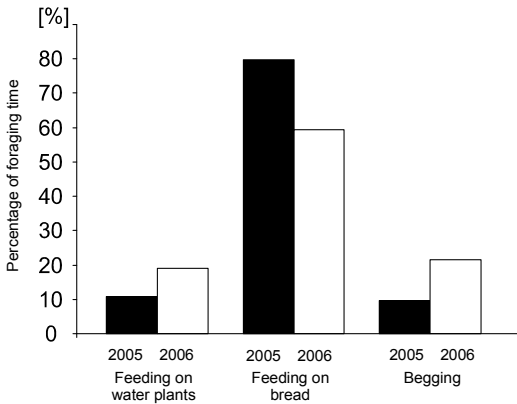


Figure 2. Percent of time spent on different foraging activities by adult Mute Swans wintering on a municipal beach in two seasons.

Procent tid med olika födosök (från vänster till höger: vattenväxter, bröd, tiggande) hos adulta knölsvanar på en kommunal strand två säsonger.

(Figure 3). Furthermore in the second year juveniles were more frequently victims of aggression (28.2% in 2005 and 57.8% in 2006) (χ^2 -test, $\chi^2=8.54$, $df=1$, $p=0.0035$). 64% of the juveniles were attacked by adults.

Discussion

Mute Swans prefer bread instead of their traditional food even in places where natural food is abundant

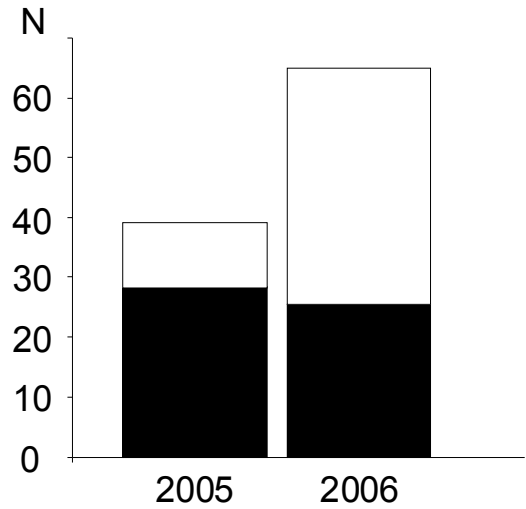


Figure 3. The total number of aggressive interactions among Mute Swans in two winter seasons. Black bar: adult bird attacked. White bar: juvenile bird attacked.

Totala antalet aggressiva möten mellan knölsvanar två vintersäsonger. Svart del av stapel: adult fågel attackerade. Vit del: juvenil fågel attackerade.

(Sears 1989, Keane & O'Halloran 1992), probably because algae and vascular water plants are comparatively poor quality food for waterfowls. The caloric value in aquatic plants is lower than in terrestrial plants and considerably lower than bread (mean from commercial data on bread caloric value: 246 kcal/100g; terrestrial plants: 40–46 kcal/100g of fresh mass, water plants 38–42 kcal/100g of fresh mass, assuming 90% of water content in plants; Verduin 1972, Dourado et al. 2004). Moreover, in large herbivore waterfowls like swans and geese food is retained for a long period in the intestines, which may lower their digestive capacities (Bruinzeel et al. 1997). Thus, bread provided by people is a high energy food source that increase foraging efficiency and minimize feeding time. However, bread made of wheat grains is deficient in several amino-acids that are required by waterfowl (Joyner et al. 1987). Hence, inclusion of water plants in the diet provides important nutrients that do not occur in bread. Thus Mute Swans included aquatic plants in the diet also during 2005, when bread provision was high.

Among many other factors weather conditions may influence the behaviour of Mute Swans wintering in urban areas. Wintering waterfowl generally have higher energy expenditure during periods

of cold stress (Prince 1979, Bech 1980). To survive low temperatures birds can increase foraging effort and minimize energy expenditure to save energetic reserves (Smith and Prince 1973, Guillemain et al 2002). In 2006 air temperatures were lower than in 2005 at the same time as provisioning of bread decreased. The major difference in activity pattern of Mute Swans between two winters was the lower feeding and resting and higher locomotors time in the colder winter of 2006. Because of the higher energy demands birds increased feeding on water plants and spent more time moving (searching of food and walking toward people) and begging. Even though the birds experienced higher energy expenditure in 2006 they did not increase the total feeding time compared to 2005. Probably in that period the swans relied on fat reserves accumulated earlier and more intensive begging from humans. The rate of heat loss (thermal conductance) decreases with body mass (Smith & Prince 1973) and the relatively low surface-to-volume ratio enable mute swans to withstand periods of low temperatures better than much smaller waterbirds. Thus, it seems that temperature and human feeding behaviour are probably two main factors that affected Mute Swan activities at a municipal beach, but the number and sex ratio of birds in the flock and availability of natural food could be also important to bird behaviour.

Results of comparable studies of Mute Swan activity patterns in urban and rural areas in southern Poland and in England showed that they spent less time on foraging and much more on loafing and aggression in the cities in comparison to those wintering in the countryside (Sears 1989, Józkwicz & Górska-Klęk 1996). In the cities Mute Swans form dense flocks and aggressively beg for food. When the competition for food increased Mute Swans showed more agonistic behaviour towards their flock mates. Usually juvenile birds are subordinate to adults (Monaghan 1980, Milinski et al. 1995) and thus juvenile swans were victims in most aggressive interactions. The increase of aggressive acts towards juveniles in 2006 was not an effect of an increase in the number of this age category. On average, there was only 1.6% more juveniles in 2006 than in 2005, but the percent of attacks on juveniles increased twice. Conover et al. (2000) claimed that grey plumage of juveniles act as a signal of subordinate status and reduce aggression from older birds, but this mechanism may not work in urban areas where Mute Swans form dense flocks and try to put themselves in better position next to people feeding them bread.

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Sammanfattning

Introduktion

Antalet övervintrande knölsvanar *Cygnus olor* i våra städer är intimt förknippat med intensiteten av fågelmatning från privatpersoner och det är till och med så att svanarna föredrar bröd framför naturliga vegetabilier om valet ges. Som en konsekvens av detta är ofta övervintrande svanar vana vid mänsklig aktivitet och har i en del fall utvecklat tiggbeteenden. Dessutom har man visat att knölsvanarna anpassar graden av aggressivitet och tiggeri beroende på födotillgången. I vår uppsats beskriver vi hur beteende och aggressivitet bland övervintrande knölsvanar i Gdynia, Polen, påverkades av en drastisk nedgång i matillgången till följd av folks rädsla för fågelinfluensa.

Studieområde

Studien genomfördes vid en mindre sandstrand nära turisthamnen i Gdynia (54°30' N, 18°32' E), norra Polen. De omkringliggande pirarnas stenfundament är beväxade med vattenväxter, främst alger, som övervintrande svanar äter av. Naturliga vegetabilier är dock endast en del av födan. Särskilt under kalla vintrar, när andra områden fryst, är bröd från människor en viktig födokälla.

Material och metoder

Under vintrarna 2005 och 2006 studerades knölsvanarnas beteende under vardera nio fältdagar utan nederbörd eller starka vindar, jämnt spridda

från januari till slutet av februari. Varje besök varade mellan kl 08.00 och 16.00.

För våra studier använde vi oss av individcenterade beteendestudier (så kallad focal sampling metod, Altman 1974), där varje session började med att vi slumpmässigt valde ut en knölsvan som vi sedan följde kontinuerligt i tre minuter. Fågelnas beteende antecknades, liksom dess ålder. Under vintern 2005 insamlades sammanlagt 810 minuters beteendestudier, att jämföras med 822 minuter under vintern 2006.

Vi delade in fåglarnas beteende i fyra kategorier: födosök, rörelser (gång och simning), vila (fjäderspning, bad eller sömn) och aggression. Vid födosök antecknade vi om maten bestod av naturlig föda (alger och andra vattenväxter) eller bröd från matande människor. Fåglarnas tiggeribeteende räknades in i kategorin födosök. Vad gällde aggression, noterades två olika beteenden: hot (när en svan närmade sig en annan med halsen rest i en båge) eller hugg (när en svan högg efter en annan med näbben).

Vi noterade också antalet besökande människor, antalet hundar och antalet människor som matade fåglarna. Temperatur mättes dagligen vid en väderstation ca 25 km från studielokalen. Statistik räknades ut enligt Zar (1996).

Resultat

Under 2005 sågs i medeltal 30,7 adulta knölsvanar per besök, medan motsvarande siffra för 2006 var signifikant högre, hela 45,6 fåglar per besök. Antalet ungfåglar var lågt och varierade från i medel 5,3 individer per besök under 2005 till 6,9 under 2006. 2006 års vintersäsong var signifikant kallare än året innan (lufttemperatur i snitt $-4,3^{\circ}\text{C}$ jämfört med $+0,3^{\circ}\text{C}$. Allra kallast var det i perioden 17–25 januari 2006, när temperaturen låg under -12°C .

Januari 2006 påträffades högpatogeten fågelinfluensa av typen H5N1 i ett flertal europeiska länder och knölsvan var den vilda art som oftast påträffades död. Den 12 februari påträffades den första sjuka fågeln i Polen. Utbrotten fick stort utrymme i medierna och folks rädsla för sjukdomen gjorde att matningsfrekvensen gick ner. Vid vår studiestrand ökade antalet besökare samtidigt som andelen personer som matade fåglarna minskade (17% 2006 jämfört med 43% 2005) och båda förändringarna var signifikanta.

Flest personer besökte stranden under söndagarna, men vi fann ingen skillnad i knölsvanarnas beteende beroende på veckodag vilket gjorde att vi valde att slå ihop data från alla veckodagar i

alla analyser. Tiden svanar ägnade åt olika aktiviteter skiljde sig signifikant åt mellan åren. Under 2005 spenderade de adulta knölsvanarna 23% av tiden till födosök och 49% till vila, att jämföras med 17% respektive 43% för vintern 2006. Under 2006 var fåglarna mer aktiva och ägnade 39% av den uppmätta tiden till att röra på sig (jämfört med 27% 2005; Figur 1).

Även dieten varierade mellan åren. Under 2005 var ca 80% av noterat födointag från bröd jämfört med 60% under vintern 2006. Samtidigt som andelen bröd minskade ökade tiggbeteendet mellan åren (10% 2005 mot 22% 2006; signifikant skillnad; Figur 2).

Aggressiviteten, mätt som antalet hugg, var signifikant högre 2006 än 2005 (Figur 3) och ungfåg-larna fick i signifikant större utsträckning stryk det andra året (28% 2005 mot 58% 2006). Den attackerade fågeln var i 64% av fallen en adult fågel.

Diskussion

Knölsvanar föredrar bröd framför naturlig vegetabilisk föda även där den senare förekommer rikligt. Detta torde bero på att bröd har mycket högre energivärde än växter. Emellertid saknar vetebröd flera

aminosyror som svanarna behöver. Därför konsumerade svanarna växter även 2005, då brödransorna var stora.

Vädret och särskilt temperaturen påverkar svanars beteende i urbana områden. Är det kallt går det åt mer energi, och för att överleva kan fåglarna öka energiintaget eller spara energianvändningen. Temperaturen var lägre 2006 än 2005 samtidigt som matningen med bröd minskade. De borde alltså rimligen ha rört sig mindre och ägnat mer tid åt att äta växter. Men främsta skillnaden i svanarnas aktivitet var att ägna mindre tid åt att äta och vila och mera tid till förflyttningar (söka föda, följa folk och tigga) den kallare vintern. Det de åt var dock växter i stället för bröd. Trots att svanarna således spenderad mer energi 2006 ökade de alltså inte den totala tiden för att äta jämfört med 2005. Detta tyder på att svanarna hade tillräckliga fettreserver lagrade för att kompensera bortfallet av bröd och den ökade energiåtgången på grund av mer förflyttningar under den kalla perioden 2006. Knölsvanar är så stora att de har ett fördelaktigt förhållande mellan kroppens massa och yta, och de klarar sig uppenbarligen utan större problem på naturliga vattenväxter när så krävs.