

## Incestuous broods of the Whooper Swan *Cygnus cygnus* in Poland

*Häckning av syskonpar hos sångsvan Cygnus cygnus i Polen*

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### Abstract

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We describe a rare case of incestuous broods of Whooper Swan *Cygnus cygnus* in Świętokrzyskie province, Poland. A sibling pair laid eggs and hatched young at the same site in 2010 and in 2011, nine kilometres from their own hatching place. Both broods were unsuccessful; the young died before autumn. We assume that the key factors explaining the inbreeding were the small local population and that Whooper Swans tend to disperse over short distances.

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Incestuous broods have been recorded in a number of bird species (e.g. Nestler & Nelson 1945, Greenwood et al. 1978, Shaw & Dowell 1989). Several cases of incestuous breeding have been documented in Mute Swan *Cygnus olor* (Coleman et al. 1994, 2001), but only very few in Whooper Swan *Cygnus cygnus* (Dudzik et al. 2010).

Two incestuous broods of a sibling pair of Whooper Swan were recorded in Poland in 2010 and 2011. On 15 May 2010 a female on the nest with the male in the neighbourhood were found in the Chycza ponds (50°42'28.37"N, 20°5'46.69"E), about 45 km south-west of Kielce. Both parents were still seen together on 3–24 October. The same pair bred again at the same site in 2011. The female with a nest and a male were recorded on 16 May. Both broods were unsuccessful. During the 2010 breeding season three cygnets aged 3–5 days were noticed with the breeding pair on 15 June. Only one survived to the late summer and was ringed with a metal ring (AH 0450 Gdańsk) on 8 August, but it did not survive to the autumn. In the following season, the pair with three nestlings was seen on 5 June 2011. One of the cygnets was ringed on 31 July. It was too small for holding the

neck collar and was ringed only with a metal ring (AH 0436 Gdańsk). The other young were marked with yellow neckbands: 0T80 (female) and 0T81 (male) on 7 September 2011. During the autumn only two nestlings were still present and both were found dead on 15 October (one probably killed by a mammal predator).

The inbred cygnets were also weighted (mean weigh = 3.6 kg), AH 0450 – 2.9 kg on 8 August 2010, AH 0436 – 2.8 kg on 31 July 2011 and 0T81 – 4.6 kg, 0T80 – 4.1 kg on 7 September 2011. The mean weight of non-inbred cygnets measured at the ponds in the neighbourhood in 2004–2011 between 22 July and 22 August was 5.1 kg ± 0.73 (mean ± standard deviation), and they were significantly heavier ( $n_{\text{non-inbred}} = 24$ ; t-test for single mean:  $t = 9.81$ ,  $df = 23$ ,  $p < 0.001$ ). The incestuous pair occupied a large reed belt in the pond, rarely visited by the people. The pond was surrounded by woodland.

Identification of the pair as being incestuous was possible because both birds had been marked with metal rings and yellow neck collars – male in 2005 (3R26) and female in 2006 (3R73) at Bałków (50°43'26.42"N, 19°58'43.30"E), nine km west

from the Chycza ponds. They were known to have the same parents, namely a breeding pair that had been marked with yellow neck collars in 2004 and 2005 in this site as well (male – 3R04 ringed by R. Włodarczyk, and a female – 3R30 ringed by K. Dudzik).

The data were collected in 2007–2011 as a part of the State Monitoring Programme (Monitoring of Rare Species), organised by the Inspection for Environmental Protection and funded by the National Fund for Environment Protection and Water Management.

The breeding population of Whooper Swan was declining in the 19th and 20th century in many European countries (except Russia and Iceland). However, since the 1950s a reverse trend has been noted and the population continues to spread southward (Boiko & Kampe-Persson 2010). The Polish breeding population size was estimated at 53–68 pairs in 2009 (Dudzik et al. 2010) and it still increases (Sikora & Wieloch 2011). In Świętokrzyskie province, where the incestuous pair was breeding, the Whooper Swan population was calculated to be 4 pairs (Dudzik et al. 2010). In this population, the birds leave the breeding sites for a couple of months in the winter to east Germany and west Poland where they winter together with other swans from rather wide areas (own ringing data, unpublished). Whooper swans appear to mate during the winter as well as in staging areas prior to their arrival in the wintering sites or in moulting areas (Brazil 2010). According to our ringing data, male 3R26 and female 3R73 spent the winter times in different areas until 2009. The first time they were seen together at Chycza ponds was on 22 March 2010. They probably mated at the winter site because before that time both birds were seen separately (female 3R73 on 13 December 2009 and male 3R26 on 6 December 2009).

Incestuous broods result in reduced fitness due to increased genome homozygosity (inbreeding depression) of the offspring, thus the natural selection should prefer behaviour which excludes the possibility of inbreeding (Pusey & Wolf 1996). Inbreeding in birds is normally reduced by natal dispersal (Szulkin & Sheldon 2008) and kin discrimination based on familiarity and experience (Wheelwright et al. 2006), as well as phenotypical cues correlated with genetic dissimilarity (Mays & Hill 2004). In spite of two breeding attempts with successful hatching, no young survived the first autumn. We observed evidence of inbreeding depression in the appearance of the young. They were much lighter and smaller compared to other non-inbred cygnets

of Whooper Swan, and we consider this failure to grow properly to be a possible consequence of inbreeding depression. In our case, the key factors of inbreeding could be the small local population and short-distance pattern of dispersal (7 records of the Polish birds, mean value 19.9 km, range 0–46 km; M. Wieloch, S. Czyż & K. Dudzik, unpubl. data). The same factors can incur hybrid broods with the Mute Swan (Bałdyga et al. 2003, Dudzik et al. 2010).

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### Sammanfattning

Parbildning av incesttyp har observerats hos många fågelarter. Flera fall har rapporterats hos knölsvan, men mycket få hos sångsvan. Vi rapporterar här om ett syskonpar av sångsvan som häckade och kläckte fram ungar i en damm nära Kielce i Polen åren 2010 och 2011. Att de två fåglarna verkligen var syskon visste vi tack vare att båda liksom deras föräldrar var märkta med både fotringar och halsringar. Föräldrarnas häckningsplats, dvs. syskonparets kläckplats, låg på ett avstånd av nio kilometer. Trots att sångsvanen har spritt sig söderut är de fortfarande sällsynta i denna del av Polen. Endast fyra par uppskattas häcka i provinsen och i hela Polen är beståndet 53–68 par.

Syskonparet fick ut ungar båda åren men inga ungar överlevde till hösten. Ungarna hade dålig tillväxt och vägde avsevärt mindre än icke inavlade ungar från trakten. Det är känt att ungar som är inavlade har sämre förutsättningar än utavlade ungar på grund av att deras arv blir mera homozygotiskt, och vi misstänker att detta kan ha varit en bidragande orsak till de misslyckade häckningarna. Trots att sångsvanarna från det aktuella området vintertid vistats tillsammans med andra svanar i östra Tyskland och västra Polen, bildade de således ett syskonpar. Första gången de sågs tillsammans var på häckningslokalen i mars 2010. Dessförinnan hade de observerat på olika vinterlokaler i december 2009. Att det blev en syskonhäckning tror vi beror på att det lokala beståndet är så litet att det inte fanns några främmande svanar att välja på när de återvände utan att ha bildat par på vinter- eller rastlokalerna.