Dear ring-reader,

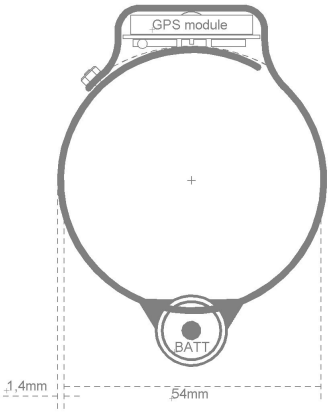
On behalf of the Netherlands Institute of Ecology (NIOO-KNAW) I would like to notify you about Bewick's swans carrying a **yellow neck collar in the series 900A**. As you may know, this is a special series of neck collars as they contain a miniature **GPS** (Global Positioning System), which has enabled us to keep track of daily individual movements at a precision of one meter! In this document you will find a short summary of the project and a call for your cooperation in the near future.

Aim

Broadly speaking, birds are given individually coded leg rings or neck collars for two reasons: (1) estimating annual survival rates in a population and (2) mapping movements of individual birds. This project mainly concerns the latter aspect. We are interested in behavioural decisions underlying the observed movement patterns throughout winter. So, we ask questions such as: What type of habitat do individual swans occupy (e.g., freshwater, arable field, grassland)? When do individuals switch habitat? At a smaller spatial scale, we are interested in which particular fields are preferred within a given habitat. The good thing about a species as the Bewick's swan is that it is huge and conspicuous, which guaranties a high chance to spot a marked bird. On average, a banded Bewick's swan staging in NW Europe is seen on 21 different days during a single winter! However, our ambitions were even higher than that. We aimed, for a number of individuals, to know their location each day during winter. This aim could never be achieved when using 'normal' neck collars. Henceforth, we decided to include a lightweight miniature GPS in a handful of neck collars.

How does it work?

Technicians incorporated four components in specially designed neck collars: a GPS, a data logger, a transmitter, and a battery fuelling the entire unit (see schematic drawing on the right). The GPS is programmed such that it measures its position once a day (with a precision of one meter), which is then stored in the data logger. The transmitter makes use of Bluetooth when uploading the data to a nearby computer. For this to happen, we need to be in close range of the bird (< 300 m), enabling an adequate communication between transmitter and computer via a 10-m long antenna (see photo on the left by A. de Groot, www.vogeldagboek.nl).



Results until now

So far, the results so are spectacular! As hoped, we get insights in individual habitat choices, timing of habitat switches, and preferences for arable fields and meadows at a small scale. Here a short overview of the main results:

An example: 924A

'924A' was one of the twelve birds that was given a GPS neck collar on 18 December 2005 in Wieringermeer (position 1 on adjacent map). Immediately after her release that same day she flew to Vooroever near Onderdijk, where she also spent the next day (2). She then crossed

lake IJsselmeer and Flevopolders and staged at lake Drontermeer for one day and at lake Veluwemeer for six days (3). On 27 December 924A occupied grasslands east of Reeuwijkse Plassen (4), spending the night on an inlet of river Lek between Lopik and Lexmond (5), and flying eastwards the next day towards Hernen near Wijchen (6). That evening however, she flew westwards again and slept at Zevenhuizerplas near Rotterdam (7). From next morning onwards (29 December) until 21 January she staged in polder Zegveld and polder Gerverscop near Kamerik (8; once, on 15 January, she was seen there by a local ring-reader). Then, for a single day, she stopped by at polder Bloemendaal near Weesp (9; spending the night at the southern edge of lake Gooimeer), where after she visited the polders around Nigtevecht for the next six days (10). On 28 January she was back in Kamerik (11), but flew to the polders north of Zoetermeer in the evening of 31 January (12). There, she spent most nights on Starrevaart, where she was discovered by a local birdwatcher in the morning of 5 February. Next day, in polder Zoetermeerse Meerpolder, her GPS was downloaded for the first time. After spending one more night at Starrevaart, she flew back to Nigtevecht next day (13). That night she slept at lake Naardermeer, and spent the weeks thereafter at a familiar site: the polders near Kamerik (14). There, we once more downloaded her GPS (20 February), where she was seen last two days later (she had probably left for Germany by then). During the first two months that 924A carried a GPS, she travelled a cumulative distance of more than 700 km, which came down to net displacement of 70 km only.

Grass quality and fuelling rate

In contemporary vegetation science one is able to quantify plant quality at large geographical scales by using satellite images (by means of measuring the reflection of infrared light).

Plotting the GPS-positions of 'our' Bewick's swans onto such maps thus gives a good impression of the daily food quality fed upon by the birds. At the same time, we estimated, as often as possible, the (change in) the shape of each bird's abdomen (see photo on the left by W. Tijsen). This enabled us to quantify rate of fuelling in these birds. This revealed that birds occupying sites with the best grass quality showed the highest fuelling rates. It also showed that the fastest fuellers were the first to leave The Netherlands during spring migration. However, there appeared to be another factor playing a pivotal role: the slowest fuellers not only consumed the lowest quality food, they also carried a mild form of avian influenza!

Avian influenza
Samples taken immediately after catching revealed that two out of the twelve GPS-swans were infected by a mild form of bird flu (not the lethal H5N1, but the non-lethal H6N2 and H6N8). Combining field observations with the GPS-data showed surprising differences between the two sick birds on the one hand and the ten healthy individuals on the other hand. Rate of fuelling was reduced by more than 50% in the unhealthy birds. This made those birds leaving Wieringermeer more than a month after the other GPS-birds. Moreover, the infected birds flew less far after Wieringermeer than the uninfected birds. In addition, detailed observations on foraging behaviour revealed lower grass consumption rates and lower digestive efficiencies in the sick birds (the latter was manifested by less bites taken per produced dropping).

Future plans
Given the success of this mission, we will equip GPS collars to another dozen of Bewick's swans this winter (2006/7). Due to the topicality of bird flu, a major part of our attention will be directed to this subject. In addition, we will continue our basic measurements on sward preference and habitat choice. Just as over the last two years we are thereby fully dependent on help of volunteer birdwatchers: in case you see one of the GPS-swans (i.e. those carrying a yellow neck collar in series 900A), please report it **as soon as possible** to NIOO via our website: http://www.nioo.knaw.nl/projects/ncfs/ncfs.cfm. Preferably, we'd hear about your resighting **the very same day**, which will enable us to trace the bird in order to download its GPS and perform behavioural observations. Your initiative will be rewarded **immediately** by an automated e-mail reply from our website which includes the life history of the spotted bird!

Overview reporting resightings
Because other ringing programmes have been started on Bewick's swans in the past, we can imagine some confusion about who to report your resighting to. Therefore, we'll here present you a short overview:

Leg ring:	WWT:	Jenny.Earle@wwt.org.uk
Blue neck collar:	Wim Tijsen:	wimtijsen@planet.nl and/or
	Jan Beekman:	bewicks_swan@xs4all.nl
Yellow neck collar (all but 900A series):	Trinus Haitjema:	info@cygnet.nl.com
Yellow neck collar (900A series only):	NIOO-KNAW op website:	
	http://www.nioo.knaw.nl/projects/ncfs/ncfs.cfm	

That's it for now! I wish you lots of pleasure reading rings this winter, with hopefully one or more 'GPS-swans' in the picture!

All the best wishes,

Jan van Gils
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