FIELD REPORT

2013

Monitoring of the Peregrine Falcon population in South Greenland

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http://vandrefalk.dk/index_eng.shtml

Introduction

The Peregrine Falcon has for many decades served as an environmental indicator for the effects of pesticides and other contaminants. Since 1981 we have conducted annual investigations of various aspects of Peregrine ecology and contaminant loads in the breeding population in South Greenland tundrius subspecies (*Falco peregrinus tundrius*).

Results include:

- The identification of a slow, gradual decrease in classical pesticide loads and associated eggshell thinning effects.[1]
- Increased burdens of new contaminants such as brominated flame retardants.[2]
- The reproduction is healthy, while breeding phenology appears to be gradually shifting towards earlier hatching dates, possibly as a consequence of changing climatic conditions.
- The Peregrines in South Greenland maintain a high productivity – 2.9 young/successful pair, or 1.9 young/ occupied territory (1981-2013). The high reproduction is to compensate for a high female adult turnover of around 25% (1985-2003).
- Ring recoveries reveals that the Peregrines migrate to Latin America – which is probably the source areas of the classical pesticides – whereas the more specific source areas of the new potentially harmful substances are more uncertain.

Research objectives

The overall project objective is to *monitor and assess current and future impacts of environmental changes – chemical as well as climatic – and their effects on the Greenland Peregrine population*. Hence, we aim to continue one of the longest raptor monitoring efforts in the Arctic.

[1] Vorkamp *et al.* (2009, 2014); Falk *et al.* (2005)
[2] Vorkamp *et al.* (2005)

Methods and approaches

The project is designed as a "lean" field programme to be conducted annually by two persons in 21-30 days. Small dinghies or Zodiacs are used to navigate the fjords between camp sites, from where the field team hikes to the selected monitoring Peregrine sites.

All field work is based on *Basic* monitoring parameters sampled at selected sites every year in the core survey area and include:

- Reproduction: number of young reaching banding age per occupied and successful site.
- Breeding phenology: Date of first hatching in each nest – measured by standard aging catalogue and wing length[3] or egg weight/measurements.
- Samples
  - Addled eggs collected for contaminant analyses
  - Eggshell fragments from hatched eggs – for monitoring the slowly improving thickness[4]
  - Moulted feathers for mercury and other heavy metals.[5]

The new geolocator study applies miniature archival light level data loggers (1,9 g)[6] providing daily locations almost year round. Adult females are (re)captured at the breeding site by standard methods we have applied for many years when studying adult turnover.

In addition, from 2013 we also collect data on prey density, i.e. line transects of passerines along the hikes to/from Peregrine nesting sites (and other trips). We identified all species and age (adult or fledgling) and counted all birds within 50 m horizontal distance from the observer path. This is a rough method providing an index for comparing changes over the coming years.

Field work 2013

Field work in 2013 was conducted 25 June - 23 July by Knud Falk and Søren Møller assisted by Lena Hansson and Marianne Lind. This year the project was supported by Bodil Pedersen Fonden, William A. Burnham Memorial Fund, Grønlandsbanken and Aase og Jørgen Münters Fond.

This year the spring was unusual cold and delayed, with very atypical snow/sleet showers and low temperatures even in late June; the summer in general turned wet and cool (data from Narsarsuaq aiport). This affected the Peregrines, apparently via their main prey base – the small passerine species – and we experienced the lowest productivity ever recorded in 31 years of field work (see details below).

A total of 18 site visits to the 12 monitoring sites were conducted. Passerines were recorded at seven different line transects covering a total of 37 km.

The standard Peregrine Falcon sample sites selected for long-term monitoring in South Greenland.

Field work is based on a boat-based two-man team navigating the fjords and hiking to each of the cliffs included in the monitoring programme.

Egg mass and measurements helps determine hatching dates.

Addled eggs are collected for contaminant analyses along with any shell fragments from hatched eggs for monitoring eggshell thickness.

[3] Clum *et al*. (1996), White *et al.* (2002)
[4] Falk *et al.* (2005)
[5] Dietz *et al*. (2006)
[6] http://birdtracker.co.uk/

Results

Occupancy
Ten of the twelve monitoring sites were occupied by at least one defensive adult Peregrine, but only 5 pairs were recorded as attempting breeding (eggs/young recorded) – table 1 and 2. For the first time in this study, a Peregrine pair was observed nesting in an old stick nest from a pair of Ravens.

Breeding success
The proportion of sites where a Peregrine pair attempted breeding was at a record low over the entire duration of the monitoring programme (table 2 and figure 1). Due to the late breeding season this year the young were too small at the site visits to ring and therefore breeding success (no of young per pair) is very unreliably estimated this particular year.

Breeding phenology
Mean hatching date for first egg in the 5 clutches was 10 July – 6 days later than the overall average (4 July) for 1981-2013; in figure 3 the late hatching dates stand out as all being above, and contributing to lifting, the overall trend line.

Samples
Three addled eggs were collected from 2 sites, and eggshell fragments collected at four of the five successful sites (table 1). In addition, moulted (adult female) flight feathers were collected at three sites. All samples were transferred to Denmark with CITES permits. The whole eggs have been opened and the contents stored at the sample bank maintained at Aarhus University, Danish Centre For Environment And Energy, for analysis of 'classical' and 'emerging' problem contaminants.

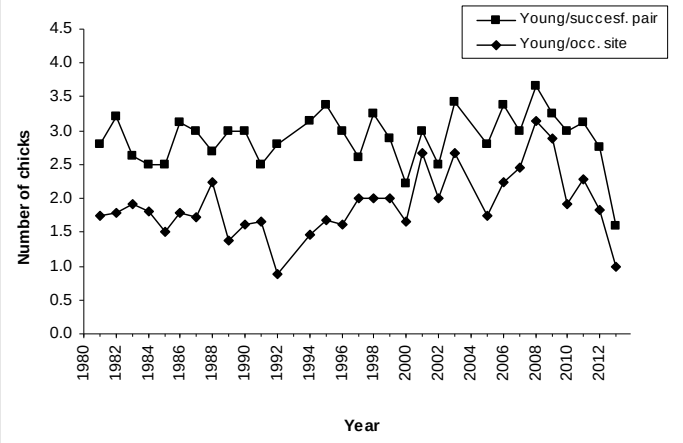

Figure 1: Annual production during the entire monitoring programme – measured as no of young per successful pair as well as no of young per occupied site – for all sites checked each year.

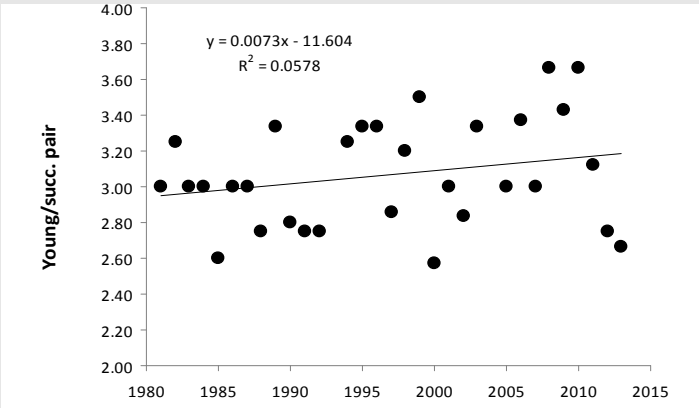

Figure 2: Annual production (no of young per successful pair) data from the selected monitoring sites only; sample size (incl. 2013) in some years is very small.

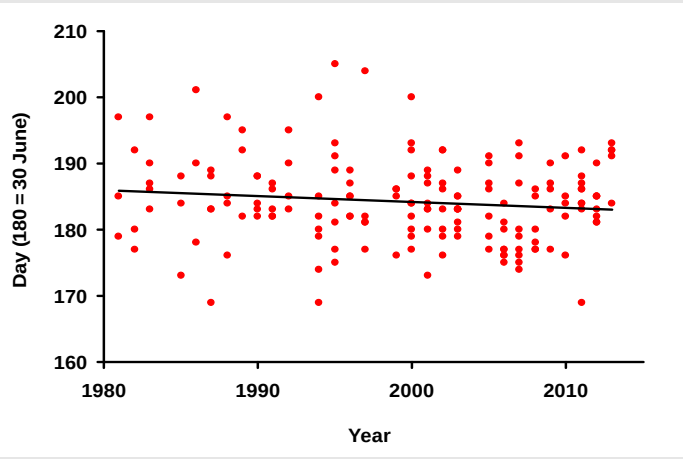

Figure 3: Hatching date for first egg in each clutch – and the long term trend (line) in breeding phenology over the 33 year study; note how the 2013 data points are all above (helping lift) the trend line (note: preliminary data only).

Monitoring of eggshell thickness
The thickness of eggshell fragments from the hatched eggs have been measured and added to the long-term trend analysis (based on Falk *et al.* 2006), showing the continued improvement in shell thickness (figure 4) although it is yet not back to normal.

Geolocators
In 2012, geolocators (GL) were deployed at five adult breeding females, and the plan was to recapture the same birds in 2013 and replace/download the GLs for analysis of movements the past year. However, in 2013 two factors spoiled that plan:

- An unusual high proportion of females – 3 of the five tagged birds, i.e. 60% – were replaced by a new female
- non-breeding females cannot be recaptured, and with the low rate of breeding attempts in 2013 it also included one of the GL-carrying females.

In addition, the single GL that was recovered unfortunately mal-functioned and contained no data.

However, three new GLs were deployed, and with a better luck next year data will be harvested. More GLs will be deployed in 2014 for harvesting in 2015 and 16.

Prey species survey
A total of 67 passerines were recorded during the 37 km of survey on 7 different line transects conducted 5-21 July (see table below). This translates into 1.68 bird per km transect. The most abundant species was the Redpoll, while the Wheatear was the only species where a significant proportion of the recorded individuals were newly fledged juveniles. Juveniles tend to dominate the landscape from early July onwards.

Species	Age	Total	per km
Redpoll	*ad*	21	0.53
Lapland Bunt.	*ad*	11	0.28
	juv	1	0.03
Snow Bunting	*ad*	7	0.18
	juv	1	0.03
Wheatear	*ad*	15	0.38
	juv	11	0.28
Total		67	1.68

We have no data from past years to compare with, but subjectively the passerines were very scarce in 2013. Surveys will be conducted the coming field seasons to monitor variation.

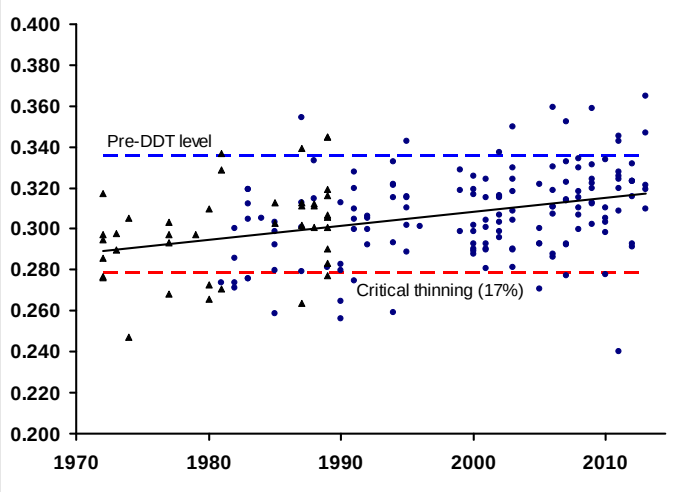

Figure 4: Eggshell thickness (incl. shell membranes) of fragments from hatched eggs in South Greenland 1981-2013 (circles) and central West Greenland 1972-1988 (triangles) as well as the joint trend line. The blue horizontal line indicates the average shell thickness in Greenlandic Peregrines before 1947 (= "normal" thickness) while the red line shows the 17% thinning threshold below which Peregrine populations have been shown to decline[7].

The female at site 42; geolocator attached to conventional leg ring visible on its left tarsus.

Passerines – the main prey of Peregrines in the study area – were scarce in 2013; this is the only juvenile Snow Bunting recorded at 37 km of line transects.

[7] Falk & Møller (1990), Peakall & Kiff (1988)

Table 1. Site checks; sites in bold italics indicate where GLs were deployed in 2012

Site no.	Date	No of eggs	No of young	Hatching (1. chick)	Notes	Samples
1	27 Jun, 9 Jul				No breeding. GL seen on female, but not captured	
2	1 Jul				no birds recorded	
6	6 Jul				2 adults, no breeding. New female (no GL on tarsus)	
7	13 Jul		3	12 Jul	GL deployed	Fragments, feather
8	14 Jul	3	1	13 Jul	1 chick + 2 pipping eggs	Fragments, 1 addled egg
23	2+4+17 Jul	4	2	12 Jul	GL exchanged on female; GL data failed	2 addled eggs, shell fragments, feather
29	30 Jun, 19 Jul				No birds recorded first time ever in 31 years	
32	5 Jul				2 adults, no breeding	
42	2+15 Jul	3	3	12 Jul	GL deployed on new female	Feather
61	11 Jul		3	4 Jul	Capture failed	Fragments
63	28 Jun				Lone male	
66	29 Jun				2 adults, no breeding	

Table 2. Summary of occupancy and productivity of the Peregrine Falcon population in South Greenland ,1981-2013

Year	**Occupancy -** number of sites with					**Reproduction**		
	Checked	Occupied	Successful	Unkn. no of young	Occ., status unknown	Total no of young	Young/ occ.site	Young/ succesf. pair
1981	15	13	5	2	3	14	1.8	2.8
1982	16	11	5	1	1	16	1.8	3.2
1983	19	13	8		2	21	1.9	2.6
1984	18	11	8		0	20	1.8	2.5
1985	16	10	6		0	15	1.5	2.5
1986	22	15	8		1	25	1.8	3.1
1987	17	14	8		0	24	1.7	3.0
1988	16	13	10		1	27	2.3	2.7
1989	14	14	6		1	18	1.4	3.0
1990	16	13	7		0	21	1.6	3.0
1991	19	14	6	1	4	15	1.7	2.5
1992	19	17	5	1	0	14	0.9	2.8
1994	20	15	7		0	22	1.5	3.1
1995	20	16	8		0	27	1.7	3.4
1996	18	13	7		0	21	1.6	3.0
1997	15	13	10		0	26	2.0	2.6
1998	15	13	8		0	26	2.0	3.3
1999	16	13	9		0	26	2.0	2.9
2000	18	15	9		3	20	1.7	2.2
2001	14	13	8		4	24	2.7	3.0
2002	14	11	8	1	0	20	2.0	2.5
2003	12	11	7	2	0	24	2.7	3.4
2005	12	11	5		3	14	1.8	2.8
2006	13	13	8	1	0	27	2.3	3.4
2007	13	13	9		2	27	2.5	3.0
2008	11	11	6		4	22	3.1	3.7
2009	12	10	8		1	26	2.9	3.3
2010	11	11	7		0	21	1.9	3.0
2011	12	12	8		1	25	2.3	3.1
2012	12	12	8		0	22	1.8	2.8
2013	12	10	5	2	0	8	1.0	1.6
Total	477	394	227	11	31	658	1.9	2.9

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Annex I: Ringing 2013

Ring nr.	Site	Date	Type[1]	Sex[2]	Age	Unit[3]
3022698*	61023	2013-07-04	K	F	4+	K
3022699	60042	2013-07-07	M	F	3+	K
3022700	60007	2013-07-12	M	F	3+	K
3022692	61001	2013-06-27	O	F	4+	K
* Recapture of bird ringed 2012						

1: O = observation of ringed adult; K=control; M = ringing
2: M = Male; F = Female
3: K = calendar year

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