

**Breeding ecology and diet  
of Great and Arctic skuas  
on Handa Island 2006**



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**Annual Report of the Handa Island Skua  
Monitoring Programme 2006**

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### **Photo credit**

Cover page: Great skua egg hatching on Handa Island, T. Jones

## 1. Summary

2006 saw the fourth full season of activities by the Handa Island Skua Monitoring Programme. Productivity of Handa's great and Arctic skua populations continued to be monitored following standard methodologies, and chicks ringed with standard BTO and Darvic colour rings. As in previous years productivity of great skuas was monitored by focusing on a representative sample of pairs spread across 2 study sites and the whole Arctic skua population monitored. Great skua diet continued to be monitored by systematic sampling of regurgitated pellets.

The great skua breeding population remained stable compared to the previous 3 years at 202 apparently occupied territories (AOTs). The small Arctic skua population continued its decline, with only 15 breeding pairs and 2 non-breeding pairs holding territory in 2006.

Mean lay-date of great skuas was 4 days later than the 2003-2005 average, however the season was more protracted than in previous years. Arctic skua lay-date was 2 days later than the 2003-2005 average.

Great skua productivity showed a marked improvement on the extremely poor 2005 season with 0.4 chicks fledged per pair. However, Arctic skua productivity was the lowest on record with on 0.2 chicks fledged per pair, equalling a total of 3 chicks. One of these chicks was predated before leaving Handa.

Predation of great skua eggs was less than a third of 2005 levels; chick loss accounted for the majority of breeding failure in both species.

Pellets collected from the club-site were approximately evenly split between fish and birds, with breeders consuming a higher proportion of fish.

A poster produced for the recent Seabird Group Conference (September 2006, Aberdeen) includes a more detailed summary of 2004-2006 great skua diet data, and is available on request.

## 2. Methods

Claire Smith conducted fieldwork between the 25<sup>th</sup> May and 15<sup>th</sup> August and Trevor Jones between the 20<sup>th</sup> and 25<sup>th</sup> of June. Danni Klein and Andrew Ramsay checked some late great skua pairs for fledglings after Claire's departure.

Methods for locating and monitoring nests were consistent with those used in previous years (see Jones, 2003; Smith & Jones, 2004; Smith & Jones 2005 - copies available from authors). The breeding ecology of 68 pairs of bonxies was monitored across 2 study sites with 34 pairs in each. As in the previous two years, the study sites differed in the number of pairs of great black-backed gulls they contained; with 7 and 2 pairs of GBBs in site 1 and 2 respectively.

The great skua all-island survey was conducted on the 30<sup>th</sup> of June and 1<sup>st</sup> July following standard methodology outlined in Walsh *et al.* (1995), and all Arctic skua AOTs and nests were mapped during June. Weekly counts were made of any birds on both species' 'club-sites' to assess numbers of non-breeding birds.

The study of great skua diet continued, sampling 19 pairs of great skua whose territories fell upon the 2 transects established in previous years (Smith & Jones, 2004, 2005). The transects pass through 9 territories in study site 1 and 10 territories in study site 2. All 19 territories and the club-site were cleared of pellets on the 26<sup>th</sup> June to ensure only pellets from the same period were collected (chick stage onwards). Pellets were then collected every 7 days and categorised as sand-eel, other fish, auk (guillemot, razorbill or puffin), gull or fulmar. All other food items were identified as accurately as possible. Otoliths were removed from all pellets and used to identify individual species using the author's collection and an identification guide (Harkonen, 1986). As in previous years, the weight and wing length of chicks from these focal pairs were measured twice during the linear growth period (13-34 days: Furness, 1983).

All 15 breeding pairs of Arctic skua were monitored. However due to the continued decline of the Handa colony, nests were not marked with canes this year in order to prevent drawing predators' attention to them, and visits to determine productivity were restricted to a minimum. For example if it was obvious from their behaviour that a pair still had chicks, a full search was not always made of the territory.

All great skua chicks were ringed with a standard metal BTO ring and plastic Darvic ring, allowing them to be identified in flight. As in previous years, ringing effort focused first on study site pulli before searches of the rest of the island were made. Arctic skua chicks were ringed and colour ringed but not weighed and measured to reduce disturbance, and due to the small sample size.

The method developed in previous years for determining Arctic skua post-fledgling mortality, involving coordinating searches of the study area (Jones, 2003), was again implemented this year.

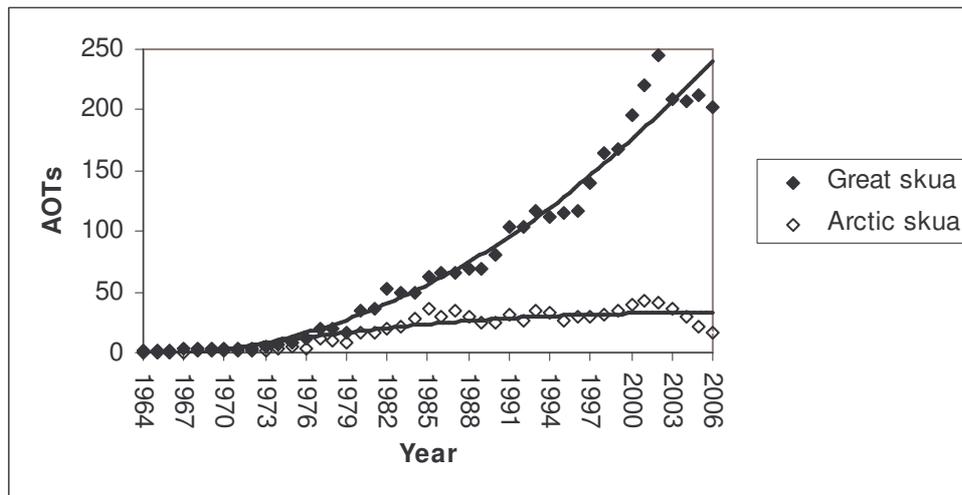
### 3. Results

#### 3.1 Populations

Great skua numbers remained stable compared to the last 3 years, at 202 AOTs, while the Arctic skua colony continued its decline with 15 pairs attempting to breed and a further 2 AOTs. (Figure 1). Only 5 pairs bred in the stronghold this year (compared to 9 in 2005) at a decreased density of 125 pairs per km<sup>2</sup>.

The number of inland great black-backed gulls fell this year, with only 7 pairs found within site 1.

In contrast to 2005, when it was observed that the large number of great skuas that failed early in the season established a second club-site in July, non-breeders were only present on their traditional club-site this year. In August up to 6 birds began to attend the second site, presumably failed breeders due to their appearance late in the season. As in 2005, no Arctic skuas were present on their club-site until July suggesting it comprised entirely of failed rather than non-breeders.



**Figure 1.** Changes in Handa's great and Arctic skua populations 1964-2006.

### 3.2 Breeding statistics

	Breeding pairs monitored	Mean laying date	Mean clutch size	Mean alpha egg volume	Hatching success (%)	Fledging success (%)	Chicks fledged per pair
Great skua total	68	May 29 (47)	1.62 ± 0.5 (68)	79.5 ± 6.7 (64)	80	33	0.43 (68)
Study site 1	34	May 28 (22)	1.59 ± 0.5 (34)	80.6 ± 6.3 (31)	77.8	21.4	0.26 (34)
Study site 2	34	May 29 (25)	1.65 ± 0.49 (34)	78.4 ± 6.9 (33)	82.1	43.5	0.58 (34)
Arctic skua	15	June 10 (7)	1.64 ± 0.5 (14)	44.8 ± 3.6 (12)	65.2	18.8	0.2 (15)

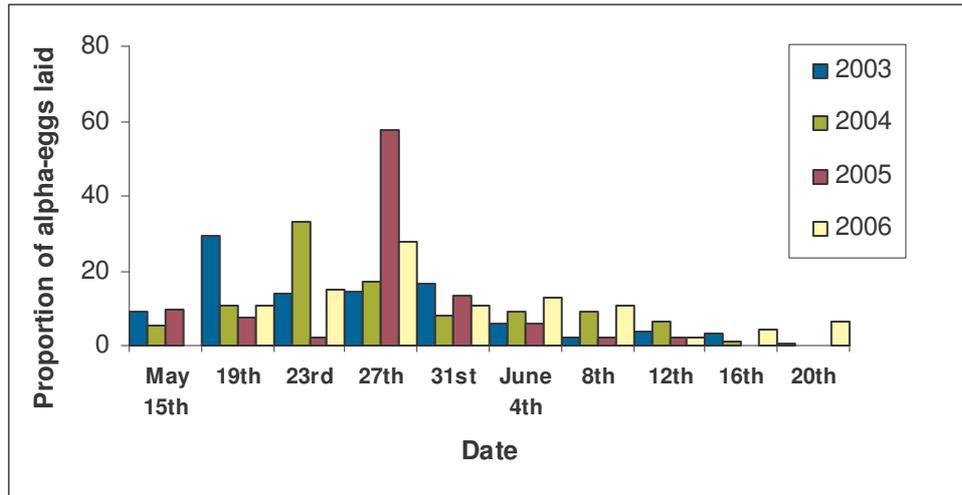
**Table 1.** Summary of breeding statistics for great and Arctic skuas on Handa Island, 2006. Figures are mean ± standard deviations with sample sizes in parentheses.

#### Great skuas

Great skua productivity was the highest since 2004, showing a marked improvement on the poor 2005 season (0.07 chicks per pair). However, when ringing effort was spread to the rest of the island, many late-laying pairs were discovered with young chicks in late July and early August, and it is unlikely that many of these survived.

Egg volume was consistent with previous years. Birds in study site 1 produced larger alpha eggs. Proportion of eggs lost was lower than in 2005. The majority of losses were due to chick mortality.

Hatching success was 5% higher in study site 2 than study site 1. However, fledging success in study site 2 was over double that of site 1. Lay-date was consistent between study sites, but alpha egg volume was slightly higher in study site 1. Breeders in study site 2 laid a slightly higher proportion of 2 egg clutches than breeders in study site 1, however the proportion of these pairs that fledged 2 young was double that of site 1.



**Figure 2.** Great skua lay-dates 2003-2006. Each bar represents eggs laid in successive 4-day periods as a proportion of the total number of eggs laid.

Great skuas within the study site laid alpha eggs between the 17 May and 19 June and mean lay-date was 3 days later than 2005. However, when the spread of lay-dates is compared with previous years, it can be seen that the 2006 season was more protracted. Several chicks out-with the study sites were also observed hatching in late July, with the latest on 3<sup>rd</sup> August.

### Arctic skuas

Arctic skua productivity was the worst on record with a total of 3 chicks fledged; one of these was subsequently predated.

Of the 11 Arctic skua alpha eggs that hatched, lay dates were only determined for 7 eggs. These hatched between 1st and 10th July. Mean lay date was 10<sup>th</sup> June, 2 days later than 2005, although consistent with previous years. 1 chick died hatching and 1 egg was found to have a longitudinal crack and did not hatch. Four pairs had their eggs predated. Mortality of adult birds during June (egg stage) was undoubtedly a contributing factor to the high level of egg loss. However, loss at the egg stage was lower than in 2005. A further 8 pairs had their chicks predated.

## 3.3 Mortality factors

### Great skuas

The level of egg predation was significantly lower than in 2005 (2.7% compared to 8.3%). This all occurred in study site 2 with no eggs being lost to predation in site 1. However, the proportion of eggs addling increased to 16.4% for all birds, with double the number of addled eggs in study site 1 compared to study site 2. As in previous years 1 chick died during hatching.

### Arctic skuas

No data available on causes of egg and chick loss in Arctic skuas.

4 adult Arctic skuas died during June this year. One bird was observed being injured in a fight with a great skua by visitors, it later died.

### 3.4 Diet

#### Great skuas

A total of 1428 pellets were collected and analysed from 19 breeding territories (902 pellets) and the club-site (526 pellets).

In contrast to 2005, non-breeders' diet was more evenly split between bird (49.8%) and fish (46.8%), with breeders' diet containing proportionally more fish (accounting for 57.2% of pellets). No previously unrecorded food items were found in great skua pellets this year.

Far fewer auk pellets were found on the club-site than in previous years; the proportion within breeders' diet remained constant. A razorbill chick ringed only 10 days earlier at Leac Buidhe was found in a bonxie pellet on 14<sup>th</sup> July. This is a direct distance of 31km, well within great skuas' known foraging range (Caldow & Furness, 2000).

Only 1 great skua chick, and no Arctic skua chicks, were found in a great skua pellets. It is unsurprising that Arctic skua pulli have only been found in pellets in one of the past 4 years, as the number of chicks hatched on Handa is very low, and some pellets are inevitably missed since not all are regurgitated on the breeding territory (Votier *et al.*, 2001).

	% of total pellets collected	
	Breeders	Non-breeders
<b>Fish total</b>	<b>57.2</b>	<b>46.8</b>
<b>Bird total</b>	<b>40.6</b>	<b>49.8</b>
<b>Other</b>	<b>2.2</b>	<b>3.4</b>
<b>n</b>	<b>902</b>	<b>526</b>
Sand eel	1.0	0.4
Fish other	56.2	46.3
Auk	23.0	29.7
Gull	13.8	14.8
Fulmar	3.0	3.4
Storm Petrel	0.8	1.5
Bird other	0	0
Great skua chick	0	0.4
Arctic skua chick	0	0
Egg	1.7	0.8
Rabbit	1.5	0.8
Crustacean	0	0.8
Goose barnacle	0.5	0.8

**Table 2.** Summary of great skua diet 2006.



**Figure 3.** Comparison of proportions of bird, fish and other pellets in diet of breeding and non-breeding great skuas, 2006. Comparison of single prey category pellets only. ‘Other’ includes rabbit, mollusc and crowberry.

### Arctic skuas

Cuttlefish bones were found on 3 territories this year. These may have been obtained from kleptoparasitising black guillemots (Phillips, 2001) which are found in the Sound of Handa.

## 4. Ringing

A total of 47 great skua chicks (29 within the two study sites) and 2 Arctic skua chicks were ringed. All ringed chicks were also fitted with a plastic Darvic ring, allowing birds to be identified from a distance by an individual letter and number combination.

A dark phase adult Arctic skua that died after a fight with a great skua was ringed as a pulli on Fair Isle in 1991, making it 15 years old in 2006. This bird had dispersed to Handa as a juvenile, a distance of 241 km. It was part of a breeding pair. Three adult great skuas colour-ringed between 1989 and 1992 were still breeding on Handa in 2006.

Colour phase was not determined for Arctic skua chicks this year as handling was minimised. The pair that produced the partially albino chick in 2005 did not reach chick stage in 2006.

## 5. Discussion

2006 saw a recovery in great skua productivity in comparison to the record low in 2005. The decline in Arctic skua population and productivity continued, with number of breeders reaching its lowest level since the population's peak in 2001.

Great black-backed gulls apparently had a poor breeding season on Handa this year, with a far higher proportion of single eggs being laid by pairs that had laid 2 or 3 eggs in previous years (Claire Smith, personal observations). The number of pairs nesting inland (i.e. amongst the great skua colony) also continued to fall. This may have helped to increase great skua hatching and fledging success, particularly in study site 1. However, as the majority of chicks produced were from the study site with fewer great black-backed gulls it is likely that increased food availability raised productivity this year.

The lower proportion of bird in great skua diet this year may reflect the fact that in 2005 great skuas took advantage of the unusually large numbers of dead auk chicks that had starved on the cliffs, or that there were more fish available in 2006. It is likely to be a combination of both factors. Higher productivity across the majority of seabird populations on Handa in 2006 compared to 2005 indicates that more fish were available (Klein, 2006). However, that the diet of non-breeders contained a far higher proportion of auk in 2005 vs 2006 (46% vs 29.6%) supports the notion that large numbers of dead auk chicks were taken (representing easily obtained food for the relatively inexperienced non-breeders).

That a razorbill chick from another colony was found in a great skua pellet confirms that Handa's great skuas do not prey on seabirds exclusively from the island's cliffs, suggesting that they may not have as large an impact on Handa's auk populations as previously thought. It is not surprising that a ringed auk has not turned up in a pellet until now, since this depends on ringing effort at seabird colonies within the area.

The Arctic skua population has declined at an average of 16% per annum since its peak in 2001. If this rate of decline continues (excluding any additive effects of adult mortality) this Arctic skua colony, on the edge of the species global range, may disappear by 2016. High rate of adult mortality reflects the breakdown of cooperative defence against the larger great skuas during territory disputes (first noted in Smith & Jones, 2005). As in 2005, the lack of a club-site comprised of non-breeders until July suggests that few juvenile Arctics are prospecting Handa as a future breeding site, perhaps because the low density of Arctic and high number of great skuas makes the island unappealing. However, 2 pairs held territories this year without breeding, and these may be younger birds that might attempt to breed next year.

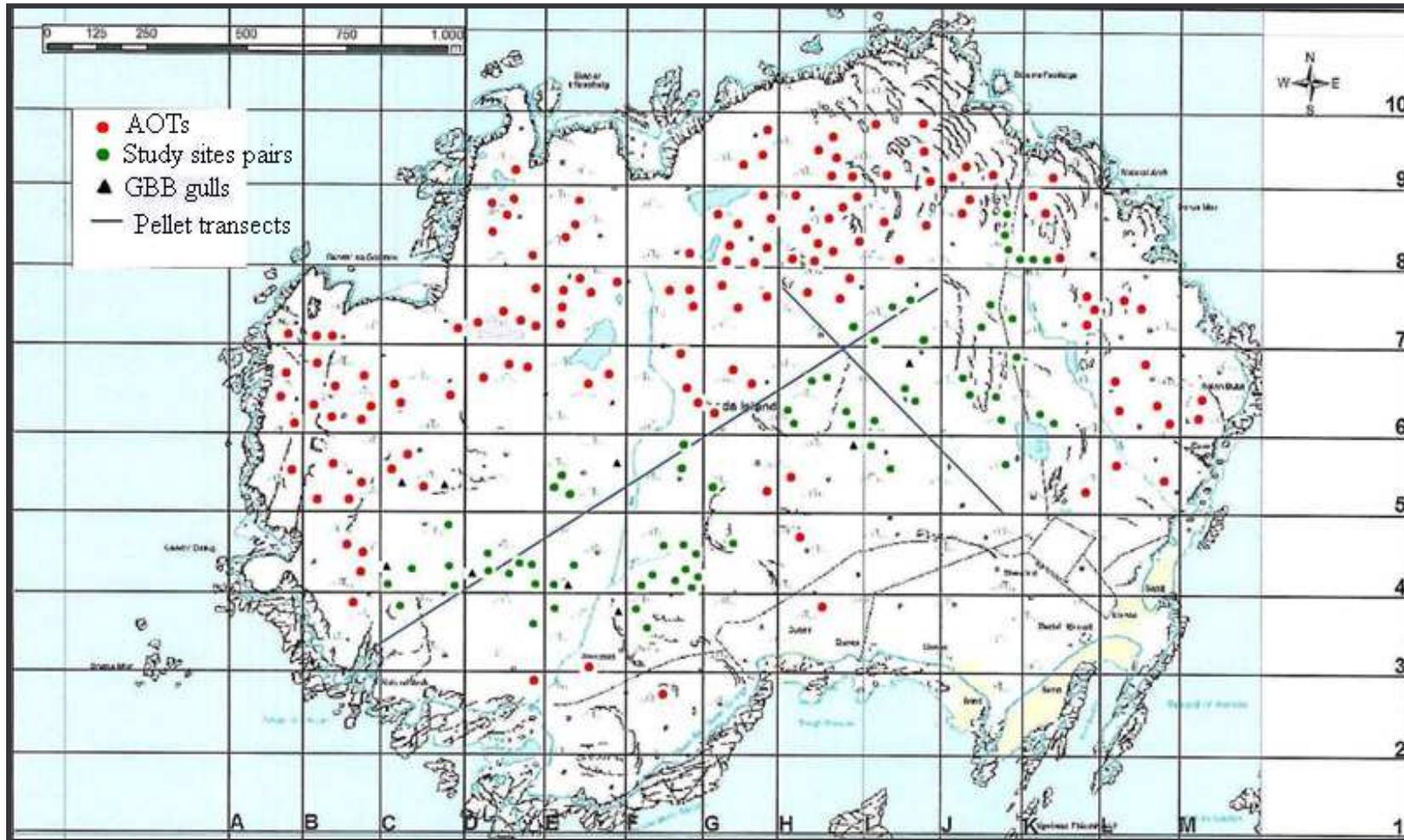
## Acknowledgements

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**Appendix 1: Great skua all island survey (30<sup>th</sup> June - 1<sup>st</sup> July 2006).** Showing 202 AOTs including 68 study sites pairs. Great black-backed gull territories within study sites and pellet transects are also shown.





### Appendix 3: Annual Workplan 2007-2009.

Optimal dates for fieldwork were identified through analysis of laying and hatching data from 2003-2006

<b>Date</b>	<b>Fieldwork: Great skuas</b>	<b>Fieldwork: Arctic skuas</b>	<b>Pellet transects</b>	<b>No. of fieldworkers</b>	<b>Notes</b>
<b>23-25 May</b>	Set up study sites – start locating, mapping & marking bonxie nests & measuring eggs	Scan known nesting areas to highlight any potential territories & bird phases	Clear all pellets along both transects	1	Conduct equipment itinerary. Leave fieldwork instructions & datasheets for subsequent visits
<b>06-20 June</b>	All-island survey; locate and process min. <u>60 focal nests</u> (30 in each study site). Count clubsite.	Locate and process <u>all nests on island</u> . Count clubsite	Clear all pellets along both transects and at club site	Min 2 people	Allow 14 days (Total)
<b>13-24 July</b>	Ring all chicks from study nests. Ring chicks outwith study sites – time permitting. Check territories for fledged chicks. Count clubsite	Ring all chicks. Count clubsite.	Collect pellets from transects and club site twice, with 10-day interval	4 people	Can be split into two trips, 4-5 days each, over this period
<b>10-15 August</b>	Check all study nests, ring chicks missed in July. Ring chicks outwith study sites. Check for fledged chicks. Count clubsite	Check territories for fledglings. Post-fledgling mortality sweep	Collect pellets from transects and club site	Min 4 people	