



Government of South Georgia and the South Sandwich Islands

Reindeer Eradication Project End of Phase 2 report

1. Introduction

1.1. Background

In the early twentieth century, Norwegian whalers introduced reindeer to South Georgia to act as a food source and as a reminder of home (Leader-Williams 1988). Since then, the lack of natural predators and disease has allowed the number of reindeer to increase enormously (Moen and MacAlister 1994).

Scientific evidence has shown that the reindeer were having a detrimental impact on South Georgia's native flora through trampling and overgrazing of indigenous plants, particularly coastal tussac, leading to soil erosion and increased distribution of more resistant, invasive plants (Leader-Williams et al. 1987). This has changed the structure of the vegetation and soils to the extent that many native seabirds can no longer nest there.

As part of its commitment to safeguarding and restoring the native species, habitats and landscape features of South Georgia, the Government of South Georgia and the South Sandwich Islands (GSGSSI) consulted widely on a number of reindeer management options. All but complete removal of the reindeer would result in continued ecological damage to the island and put at risk the success of the project being run by the South Georgia Heritage Trust to eradicate non-native brown rats and mice from the entire island.

1.2. Summary of Phase I

The first phase of the reindeer eradication project was undertaken in the Busen area in January and February 2013. Following the recommendations of an advisory group on reindeer management methodology, and a reconnaissance trip in 2012 (Eira and Kilander 2012), the decision was taken to trial a combination of herding and ground shooting to

eradicate reindeer from this area. These two methods were thought to provide the best balance between the need to eradicate the reindeer in an efficient and humane manner, to remove the bulk of carcasses and to allow recovery of commercially viable products. Overall management of the project was the responsibility of GSGSSI, but the Norwegian Nature Inspectorate (SNO) provided advice on methodology and specialist staff. The eradication team consisted of ten Sami reindeer herders, four SNO marksmen, four science assistants, a vet, a doctor and three project management staff. *Pharos SG* was used as a support vessel and a seatruck was operated to move cargo and carcasses between ship and shore.

On the whole the operation went relatively smoothly, although herding animals from outlying areas proved to be problematic. Ground shooters proved to be highly effective in clearing animals where herding was not possible and then sweeping through the area as a whole to mop up stragglers. In total, 989 animals were gathered during the herding operation and meat was recovered from 929 (approximately 60 were killed on shore for local consumption or because they were in poor body condition and required euthanizing). A further 1,020 animals were shot bringing the total for the Busen area to 2,009. In Phase I, shooters also began work on the Barff Peninsula and shot 1,555 animals (see http://www.sgisland.gs/download/environment/phase%201%20summary%20report_19%20sept.pdf for the full report).

2. Overview of Phase II Operations

2.1. Methodology

Following the completion of Phase 1 there was consultation between GSGSSI, SNO and external experts directly involved in the project to determine the most appropriate methodology for use in the Phase II area. At the end of this consultation period it was decided that the most humane and cost effective method for removal of reindeer on the Barff Peninsula would be to use a ground shooting alone with recovery of meat only for local consumption.

Shooters would work from a series of temporary field camps, systematically searching the surrounding area and clearing it of reindeer. To avoid the need to re-locate camps at the end of each shooting period, depots were positioned at strategic locations (Figure 1) and left in place for the duration of the project.

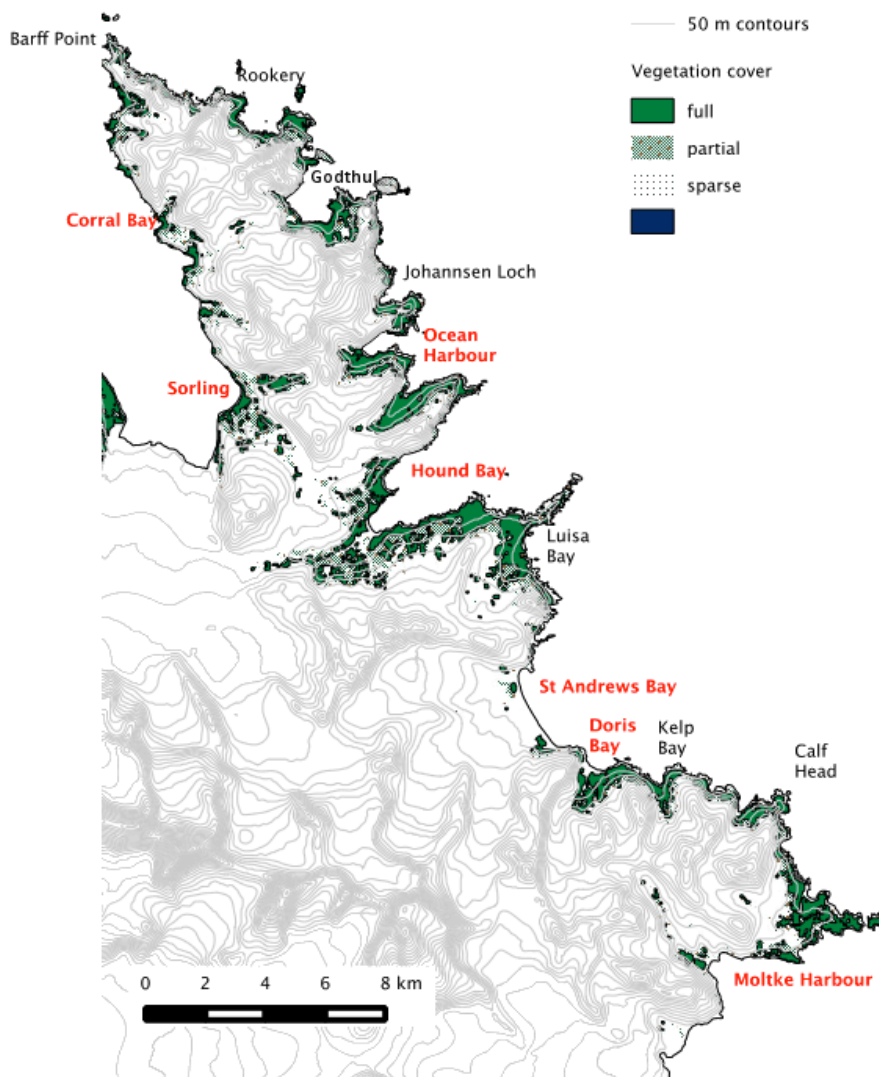


Figure 1. Map of the Phase II area. Depot sites are highlighted in red.

2.2. Planning

Logistically this method was relatively simple in comparison to the Phase I operation and there was little need to purchase additional equipment or supplies. The switch from working from one central camp as in Phase I, to a number of satellite camps/shore depots, meant there was a need to buy some additional camping equipment and light weight food. The majority of the equipment that was required was purchased in the UK through South Atlantic Trading Ltd (SATLAN). Equipment purchase was co-ordinated by GSGSSI with advice on specifications of specialist items from the SNO.

Importation and transport of ammunition was perhaps the most challenging element of the pre-departure planning. A ground shooting only methodology required relatively large amounts of ammunition, ensuring timely delivery of this was paramount. The number of rounds needed in the Phase II operation was unknown as population estimates were subject

to some degree of uncertainty. As a result it was decided to purchase 4,000 rounds of Norma ballistic tip 0.308 ammunition. Ammunition was shipped directly to South Georgia from the UK on board the British Antarctic Survey (BAS) vessel the RRS *James Clarke Ross*.

2.3 Field Operations

The field team consisted of six marksmen from SNO, a medical doctor and a project manager. Other staff involved in the project included an additional member of staff from SNO who assisted in the initial few weeks of field operations and field workers who were needed for science sample collection and butchery.

Norwegian personnel travelled to South Georgia on board the MV *Pharos SG* arriving on January 1st. Upon arrival on South Georgia shooters undertook general briefings and first aid training before being deployed to the field. Shooters were supported primarily by the MV *Pharos SG* that acted as a communications hub for the project and used its zodiac to deploy shooters and equipment to the field. However, BAS boating support was used at times to move shooters to and from sites on the western coast of the Barff Peninsula.

Although all reindeer in the Phase II area originated from the same initial introduction event, topographical barriers mean that movement between some areas is likely to be infrequent. In essence, this meant the area could in effect be divided into three zones. The first two zones were in the Northern Barff area. One zone covered Corral Bay, Godthul, Rookery Bay and Barff Point, the other covered the relatively open central area covering Hound Bay, Louisa Bay, Ocean Harbour, Johannsen Loch, and Sörling Valley (see Figure 2). Large numbers of reindeer had been shot in the first zone during the 2013 operation (Phase I) and two marksmen were able to clear most of the remaining deer in a short amount of time. In the relatively open terrain in the second zone, shooters worked in teams, positioning themselves to shoot reindeer that had been flushed between coastal areas. Thoroughly searching this large area and clearing it of reindeer took several weeks.

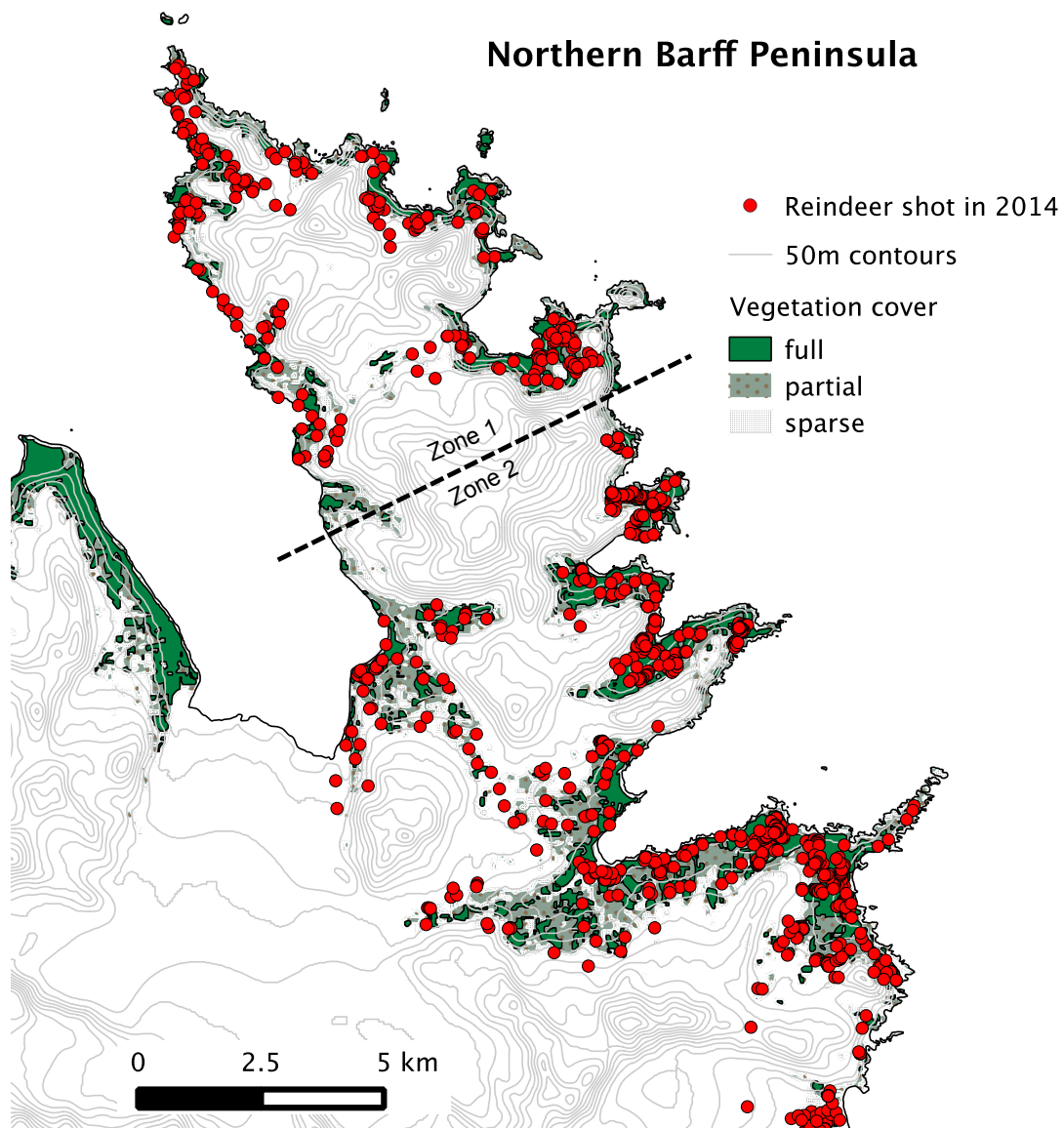


Figure 2. Position of animals shot in the Northern Barff Peninsula in 2014

The third zone was in the Royal Bay area and included St Andrews Bay and south to Moltke Harbour, including the rugged coastline between Doris Bay, Kelp Bay and Calf Head (see Figure 3). This area was poorly mapped and difficult to access but contained a relatively narrow fringe of vegetation which, to some extent, simplified the search strategy.

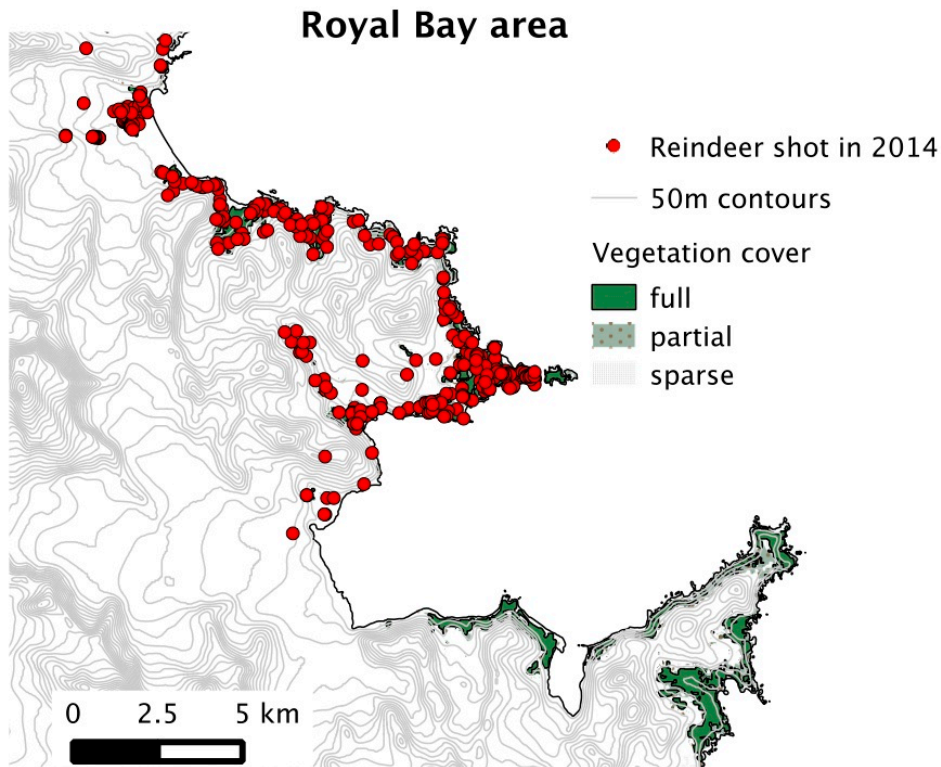


Figure 3. Positions of animals shot in the Royal Bay area in 2014

In total, 3,140 animals were shot in Phase II over the course of 160 man days in the field. Table 1 provides a breakdown of the number of animals shot in each area and number of field days spent.

Table 1. Animals shot, and number of field days spent in each zone

| Area | Number of reindeer shot | Number of field Days |
|---|-------------------------|----------------------|
| Barff Point, Corral Bay, Rookery Bay, Godthul | 224 | 20 |
| Hound Bay, Luisa Bay, Ocean Harbour, Johannsen Loch, Sörling Valley | 1,328 | 66 |
| Moltke, St Andrews Bay, Doris Bay, Calf Head, Kelp Bay | 1,588 | 74 |

Unlike Phase I where there was a need to remove all carcasses from the Busen Area so as not to jeopardise the SGHT rat eradication, during Phase II it was possible to leave all carcasses *in situ*. However, it was noted that reindeer carcasses shot on the Barff Peninsula the previous year, that had been left intact, were clearly used as a food source by rats (see Figure 4). Whenever possible, the carcasses of animals shot during Phase II were opened up

to make them more accessible to scavenging birds, thus minimising the time rats could use them as a food source.



Figure 4. Rat holes in remains of carcasses shot in 2013. Photo: L.O. Lund

It had been hoped to spend approximately 6-10 additional field days searching in the area around Barff Point but extremely strong winds in the last week of operations meant this was not possible. Approximately one week after shooters left South Georgia, a group of females and calves, including at least eight animals, were seen just to the south of the Point.

2.4 Meat recovery

Unlike in Phase I where meat was recovered for commercial sale, in Phase II meat was recovered only for local consumption. The aim was to recover enough meat to supply the residents of KEP for 18 to 24 months.

The majority of meat was recovered from the Sörling Valley area as large numbers of animals were shot in the immediate vicinity of the field camp making processing and collection relatively simple. Meat was also recovered from some animals shot in Ocean Harbour and Moltke Harbour. Although some whole carcasses were recovered, the focus was on hind quarters and outer fillets as these could easily be butchered in the field and carried to shore depots

Hind quarters and fillets were brought back to KEP where they were hung in an adapted shipping container. Scaffold bars were installed to provide a hanging frame and insect mesh was taped across the doors (Figure 5).

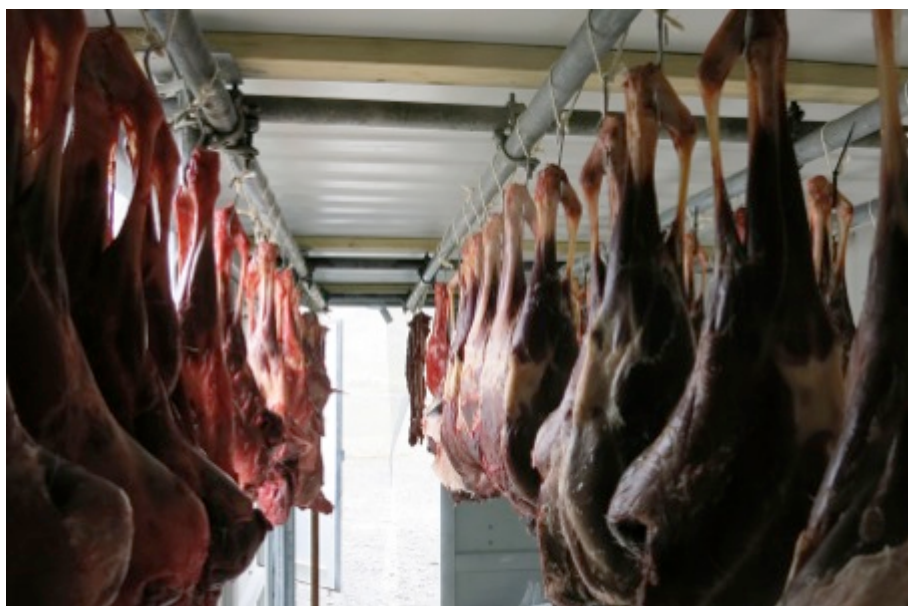


Figure 5. Inside the meat hanging container. Photo: C.E. Kilander

The Base Commander and doctor were consulted about what cuts of meat would be most useful on base and GSGSSI staff and a member of SNO processed the meat accordingly (see Table 2). In total, more than 387 kg of meat was recovered.

Table 2. Cuts and quantity of meat recovered during the 2014 operation

| Cut | Units total | Average unit weight (kg) | Total weight (kg) |
|-----------------------------------|--------------------|---------------------------------|--------------------------|
| Boned leg | 46 | 1.13 | 52 |
| Diced | 18 | 1.06 | 19 |
| Inner filet | 3 | 1.17 | 3.5 |
| Kidney | 1 | 1.00 | 1 |
| Leg on bone | 49 | 4.00 | 195.9 |
| Liver | 3 | 1.67 | 5 |
| Mince | 11 | 1.00 | 11 |
| Outer Filet | 20 | 1.15 | 23 |
| Rump (2-3 per pack) | 22 | 1.32 | 29 |
| Shanks (6-8 per pack) | 10 | 3.15 | 31.5 |
| Silverside/Topside (2-3 per pack) | 18 | 0.94 | 17 |

TOTAL 387.9

The manner of the meat recovery i.e. in the field rather than in a dedicated slaughter facility, required extensive 'trimming' during butchery to remove dirt and hair from the outer surface. This added to the absence of temperature regulation during the tenderisation period and lack of veterinary supervision during slaughter and processing, meant that the meat is not suitable for sale to the general public.

2.5 Firearms safety

To ensure the safety of all involved with the shooting operation and all those in the vicinity, strict firearms handling procedures were followed at all times. Live fire operations covered different areas at different times, making good communication between the firearms safety officer, government representative and all vessels in the area essential. To facilitate this, for each live fire operation a firearms safety plan was completed and a closed area was delimited. The Government Officers communicated the position and duration of closed areas to all vessels in the area.

The shooters were highly mobile and often worked over a wide area, this meant that it was necessary to close most of the visitor landing sites on the Barff Peninsula for the majority of the operational period. Closed areas were designated for between 5 and 10 days thus allowing vessels to plan their itinerary accordingly. Although it had been hoped that St. Andrews Bay could be kept open for much of the project the high number of animals in the Doris Bay area meant it was necessary to close St Andrews Bay for much of the latter half of January. This was a disappointment to some vessels but was unavoidable.

2.6 Wildlife disturbance

Suppressors were used on rifles to reduce the amount of noise and minimise wildlife disturbance. Shooters observed that even with a silencer, animals (fur seals, penguins etc) would typically stop their natural behaviour immediately after the shot was fired but then would resume previous activities some moments later. When multiple shots were fired in a short space of time, the amount of disturbance appeared to increase with animals beginning to move away from the source of the noise

There was some concern that the shooting may cause more than minor and transitory disturbance at St. Andrews Bay because of large numbers of king penguins and the presence of reindeer on the outskirts of the colony, (Figure 6). To mitigate against this, two GSGSSI field workers worked with the shooters to herd animals away from the immediate vicinity of the colony and up into the moraines. This technique worked well and approximately 50 animals were dealt with in this way.



Figure 6. A shooter looking for reindeer above St Andrew's Bay. Photo: T. Solstad

A small number of animals were reluctant to move away from the colony and rather than risk them fleeing through the centre of the colony, they were shot *in situ*. During the shooting at St Andrews Bay, Government observers watched the colony and were satisfied that only adult birds on the periphery of the colony moved away from the sound of the shooting, typically in the direction of the sea. These birds were not associated with chick brooding or egg incubation and so this displacement is of no significance to the breeding success of the colony. No freshly dead chicks or abandoned eggs were found on the periphery of the colony immediately after shooting.

2.7. Science sampling

As part of an initiative to assist the scientific community in undertaking reindeer related research, Government staff and SNO personnel collected samples before and during the operational period. The main areas of research were vigilance and flight-fright behaviour response, investigation in to diversity of gut flora and genetic analysis of population structure.

3. Finance

Costs incurred directly during for Phase II of the reindeer eradication project was in the region of £142,472. Costs can be broken down as follows:

| | |
|-----------------------------------|---------|
| Salaries | £96,394 |
| Travel | £19,597 |
| Accommodation on <i>Pharos SG</i> | £9,552 |
| Planning* | £7,600 |
| Firearms | £5,078 |
| Equipment | £5,515 |
| Freight | £296 |

* This includes £6,411 staff time from SNO

Other costs incurred but not included in the main budget include: staff time for GSGSSI employees (during planning g and operational phase), charter fees and fuels for *Pharos SG*, fuel and staff time for BAS jet boats

4. Conclusion

On the whole, Phase II of the reindeer eradication project went well and in the amount of time available field teams did an outstanding job. The small size of the project team meant it was possible to build good working relationships, meet everyone's individual needs and still achieve the main objectives of the project.

Some additional searches and shooting of remaining animals will be needed in 2015 to ensure all reindeer are removed before the start of the final phase of the SGHT rat eradication project. Based on estimates of the number of animals that remain, a decision will be made as to whether Norwegian marksmen will return or whether local personnel will be used instead.

5. Acknowledgments

Thanks to the staff at KEP and the captain, officers and crew of the support vessel MV *Pharos SG* for their hospitality. As well as providing staff and expertise on the ground, Statens Naturoppsyn provided valuable insight during the planning stage of the project. South Atlantic Trading Ltd are thanked for their expertise and advise during equipment procurement. Major Peter Biggs is thanked for his work in reviewing the firearms safety procedures and, Richard Whitely is thanked for his invaluable assistance in procurement and shipping of firearms and ammunition

6. References

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