

Environmental Inspection, Gough Island Wildlife Reserve, September 1999

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Summary: ACTIONS REQUIRED

1. Accommodation on the base during takeover needs to be reassessed in view of increasing demands for visitors from Tristan to stay on the island. An annex to the upper air building has been mooted as a possible solution. **Action: DEAT, Tristan government**
2. A visitors' guide, similar to that produced for Marion Island, is needed for Gough Island. **Action: DEAT, GIWRAC**
3. Use of containers previously used at Marion Island should be discontinued, or at least completely repainted (inside and out) between trips. **Action: DEAT**
4. Follow-up of control measures for *Sagina* are essential. **Action: Gough 45 team**
If necessary, another dedicated person may need to be sent during the 2000 relief. **Action: GIWRAC**
5. Samples of 'infected' island tree need to be sent to a plant pathologist for examination. **Action: Steven Chown.** Marked trees need to be monitored for rate of spread and impact of the infection. **Action: Gough 45 team**
6. DEAT must present GIWRAC with written proposals on the following issues prior to the 2000 relief: a) a motivation for landing fresh produce (types of produce, amounts and transport conditions), b) a strategy for cargo off-loading at the base, and c) a response to calls for improved incineration and waste food treatment systems at the base. **Action: DEAT**
7. Promote the purchase of cans rather than plastic cooldrink bottles by island-based personnel. **Action: DEAT**
8. Put a protective cover over the helipad light switch (and other external lights) to prevent them being turned on accidentally. **Action: DEAT**
9. Aluminium ladders (at least five, of varying lengths) should be sent to Gough as soon as possible to improve/prevent further deterioration of paths. **Action: DEAT**
10. An effective programme has to be instituted to remove weeds from the area surrounding the NDPW store at Wingfield. **Action: NDPW**

PROGRESS MADE

1. The out-going team, Gough 44, appeared to have adhered strictly to the outlines of the management plan. The team also provided regular feedback on issues arising during the year (e.g. new peatslips, condition of paths and the status of *Sagina*). The team's Conservation Officer, Belinda Enslin, is commended for keeping excellent records of activities outside the logistic zone (e.g. hiking log) and of environmental work conducted voluntarily by the team during the year (seal and seabird monitoring programmes).
2. The newly-appointed master of the *SA Agulhas*, Capt. John Klopper, was responsive to suggestions regarding conservation-related issues, and made special efforts to arrange equipment for cleaning passengers' shoes, reducing lights at night, and placing rat guards effectively on hawsers

while docked in Cape Town prior to departure.

3. The Department of Environmental Affairs and Tourism (DEAT) voyage co-ordinator, Kobus Boooyse, responded swiftly when issues were brought to his attention. However, he lacked sufficient autonomy to address some issues that arose.
4. There has been considerable improvement in communicating the requirements of the management plan to team leaders and other personnel prior to the takeover. Inviting the environmental inspector to the relief planning meeting was a positive step. Relief personnel had a positive attitude to the environmental controls imposed on the running of the base. However, there remains room for improvement. A document such as the Marion visitors' guide would be useful for takeover personnel.
5. Having an island-based biological programme with personnel on the team will further improve environmental awareness and understanding, although there will be a greater trampling impact outside the logistic zone.

PROBLEM AREAS

New concerns

1. As potentially the worst environmental event at Gough Island in the last 50 years, the introduction of *Sagina* was not accorded sufficient importance or priority by the South African authorities from the time the weed was first detected. This reflects badly on their management of the base. *Sagina* apparently is largely restricted to the immediate logistic zone (crane platform and adjacent slope, crane control point, diesel pumping area, and cracks in the cement slabs leading to the main base); only one seedling was found outside this area (on the path to Seal Beach). The control measures implemented may succeed in eradicating the plant, provided there is regular follow-up. Having biologists based at the island for the next two years should enhance the likelihood of eradication.
2. The use of equipment and storage containers at Gough Island that previously have been used elsewhere remains the greatest single threat for biological introductions to the island. This issue also has been raised for Marion by the PEIMC.
3. The siting of cargo carried ashore by helicopter is problematic, both given the new DEAT policy regarding limiting downdraft impacts on building and, more importantly, its effect on the *Sagina* eradication programme.
4. Many island trees *Phylica arborea* in the southern part of the island have yellow leaves, apparently linked to a fungal infection. Some trees have died, possibly as a result of being infected. Although samples have been collected, it may prove necessary to send a plant pathologist to investigate the source and severity of this possible problem.

Recurring issues

1. The provision of some fresh produce to the island is unacceptable, especially given DEAT's strict policies on this matter for Marion Island. As a matter of principle, environmental controls by DEAT at Gough Island should be at least equivalent to those in place at Marion Island. Pineapples were brought ashore, despite refusing permission for them being taken before sailing from Cape Town. If fresh produce is brought ashore, it should be all packed into containers rather than slung in cargo nets, and should not be landed onto vegetated areas.
2. The concrete apron and environs surrounding the PWD store in Wingfield remains heavily infested with weeds, including potentially damaging species such as fountain grass *Penisetum plumosum*.

These weeds must be cleared before cargo for Gough is stored there, and recommendations are made to achieve this in a cost-effective manner.

3. Although most clothing was well cleaned before being re-issued to takeover personnel, a random inspection of items in the stores found clumps of mud on some gumboots and seeds on the velcro patches on wet-weather gear. Continued vigilance is needed, and ideally velcro should not be used on re-issued clothing.
4. The question of waste disposal during the takeover period remains unresolved. An improved incinerator system and a macerator for food wastes have been requested for several years.

OTHER POINTS

1. The old helipad remains intact, and there is no problem with pollution. It is being colonised by alien grasses (primarily *Poa annua*), but this is not a major problem provided personnel avoid walking on the affected areas prior to leaving the logistic zone.
 2. The buoy GPS dome was moved from its position on the roof of the upper air building to a new, purpose-built tower in the quadrangle adjacent to its former site. No significant impacts occurred as a result.
 3. Sea surface temperature is being measured by lowering the thermometer through a drainpipe leading off the cliff below the crane. This arrangement is satisfactory, provided the pipe is pulled up if threatened by easterly storm seas.
 4. Three structures were removed during the relief: a disused 5-m aerial east of the base, a 1.5-m wooden pillar at the site of the 'new' magnetometer hut, and a humorous sign erected next to Blechnum Bridge (technically outside the logistic zone and thus in contravention of the management plan). In addition, the rhombic aerial, dismantled in 1996, was removed.
 5. While we are still awaiting the report from Johan Loocke, the geologist asked to investigate the peat slip above the collapsed Archway, the slip area is revegetating, but the steep scarp face remains loose and friable. It is likely to erode further, but further dramatic slips are less likely.
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Background and relief schedule

PGR accompanied the 1999 annual relief voyage to Gough Island to conduct the ninth environmental inspection in terms of the Gough Island Wildlife Reserve Management Plan (Cooper & Ryan 1994). His original intention was to visit Gough as a co-project leader (with Steven Chown and Kevin Gaston) of the SANAP biological research programme commencing at the island this year. As the only leader with knowledge of the island, this was deemed essential. However, space constraints forced him to accept the mantle of Environmental Inspector, despite possible conflicts of interest. JPG, Chief Islander and head of the Natural Resources Department of Tristan da Cunha, joined the vessel at Tristan and remained at Gough throughout the relief. During the course of the takeover he was joined by his assistant, Norman Glass, who had been inspecting fishing practices aboard the *Edinburgh* off Gough. Also present on the relief was Dr Niek Gremmen, who was appointed by the Tristan government to tackle the introduced population of *Sagina* that was discovered at the base by Christine Hanel during the 1998 inspection.

The *S.A. Agulhas* departed Cape Town on 2 September 1999, arriving at Tristan da Cunha on 9

September. Due to the arrival of the *Edinburgh* the same day, plus a shortage of cargo handlers on the island due to an outbreak of 'flu, the *Agulhas* departed the same evening, arriving at Gough on 10 September, when personnel and their kit were flown ashore. Cargo off-loading by helicopter took place on 11 September, and the ship left the island on a buoy-deployment cruise the following day as the weather was deteriorating.

The *Agulhas* returned to Gough on the evening of 24 September. Diesel pumping took place on 25 September, and back-loading of cargo on 26 September. The *Agulhas* sailed for Tristan on 27 September. We went ashore at Tristan; PGR to continue research in the Tristan group, and the *Agulhas* departed for Cape Town.

Activities prior to departure

As environmental inspector, PGR was invited to attend the voyage planning meeting held in Cape Town in July. Team leaders from all groups were present, and this was a useful exercise that previously has not included the inspector. PGR also was invited to address the new team and interested people from DEAT on the conservation management concerns at Gough Island during an informal seminar on the morning of 30 August. A similar talk was given aboard the *Agulhas* on 8 September.

Impromptu inspections of the DEAT and PWD stores were made on 5 and 25 August. No-one was present at the PWD stores on 5 August, but PGR was able to inspect the perimeter of the property, which was heavily infested with weeds, as noted by previous inspections. On the second visit, PGR was escorted around the site by Mr Richard Parker, who pointed out rodent bait stations as well as the equipment being cleaned in preparation for the voyage. A rodent-free certificate (dated 18 August 1999) was provided subsequently. All containers appeared clean, with some being freshly painted for the trip. Mr Parker raised the issue of the weeds, saying that they sprayed but that they grow back very rapidly! Niek Gremmen suggests treatment with a combination broad-leaf and grass herbicide to remove the existing plants, and then an annual spray with Weedmaster D (active ingredient diuron) to prevent all regrowth. This is a cost-effective way to solve this problem. The proposed relocation of the store to Customs House on the Cape Town foreshore would solve the problem entirely.

The DEAT stores in Paarden Eiland were in a poor condition at the time of the first visit, with copious bird droppings on equipment and containers, and a large pile of disused gear piled in a corner. A spot check of boots ready for re-issue in the clothing store found roughly one in ten to have large clumps of mud and vegetation on their soles (possibly a result of the 'emergency' voyage to Marion Island in July 1999). However, the situation was being addressed, and by 25 August there was a marked improvement in cleanliness, and all the boots checked were clean. Some seeds and other vegetation were found stuck in the velcro strips on the leggings of the waterproof trousers. This problem was pointed out to the store manager, Mr Denzil Windwaai, who undertook to inspect all such clothing issued.

Mr Sam Oosthuizen (DEAT) was very co-operative and showed me around the facility on both visits. He pointed out the many improvements being undertaken, including preventing access to birds from the roof. Random containers were inspected for cleanliness, including raising one on a fork-lift to inspect the underside. The bottom has numerous nooks and ledges, and although these proved to be relatively clean, they remain the most likely means of transporting *Sagina* to Gough Island (the containers stand on the vegetation at Marion for 3-4 weeks each April-May). Mr Oosthuizen was well aware of the problem, but stated that cost constraints prevented the use of dedicated containers for Gough Island.

Bait stations for rodents were deployed throughout, and had fresh bait. A rodent free certificate

dated 27 August 1999 was provided subsequently, as were certificates for Freight Forwarders (dated 25 August) and Table Bay Marine (dated 31 August), who handled the Tristan cargo.

The *SA Agulhas* was in dry dock in Simon's Town until the weekend before sailing. She berthed directly at B berth in Cape Town's Duncan Dock. The adjacent warehouses were clean and devoid of foodstuffs likely to attract rodents. Rat guards were in place on all hawsers when the ship was visited on 1 September, but some had been blown around by the strong wind and would not have been effective. PGR pointed this out to the Captain, and when next inspected, the rat guards had been doubled up and looked likely to prevent access by rodents. A rodent free certificate dated 29 August, was provided, and a casual inspection of the hold revealed no sign of rodent droppings.

Activities at Gough Island

Takeover personnel

In addition to the old (6) and new teams (8, including two biologists*), personnel from the following departments remained on the island for the duration of takeover: DEAT (3: coordinator, engineer and stock-taker), SA Weather Bureau (1), National Department of Public Works (8), Tristan government (3: chief islander, environmental inspector and Niek Gremmen as specialist to assess and control the *Sagina* invasion), SA National Defence Force (1 chef), and biologists from the Universities of Pretoria and Sheffield (1 each). Requests for additional personnel to visit the island during the relief were denied because of inadequate space on the base. In the event, two people remained in the emergency base throughout the relief, resulting in two free beds in the main base. Problems with the freezers aboard the *Edinburgh* forced Norman Glass (fisheries observer from the Tristan Natural Resources Department) to be allowed ashore on 17 September. He was accommodated in the emergency base, still leaving two beds free in the base (and space for at least three others in the emergency base).

When the *SA Agulhas* returned to Gough, approximately 25 members of the ship's crew requested special permission to visit the island. This was granted provided all groups wanting to leave the catwalks were guided by a team member, with no more than eight 'tourists' per guide. This is the same condition that apply to tour groups visiting Nightingale Island, and the visit occurred without incident on 26 September.

Arrival and cargo transfer

The first flight ashore took place at 15h30 on 10 September, and comprised an inspection team made up of the voyage co-ordinator and other DEAT personnel, the NDPW leader, the SA Weather Bureau representative, new team leader, PGR and JPG. The airforce personnel then flew ashore and shut down until the inspection was complete (approximately two hours). Personal kit and remaining personnel were landed at dusk. Despite requests, no space was made available for Niek Gremmen on one of the early flights to allow him to assess the status of *Sagina* on the crane platform, despite the fact that this was to be used for storing containers the following morning (see below).

The base was in good condition, with only a few items of rubbish outside the buildings (mostly under the station, along the catwalks and at the incinerator/skivvygat). The annual mouse tally was 156 killed, down on previous years; it is unclear whether this is a result of fewer mice on the base, or less effort by the team. The catwalks had been cleared of vegetation, but some localised aliens were not

* One of the biologists resigned from the team and returned to South Africa. He will be replaced during later in 1999 or early in 2000, depending on availability of a suitable replacement and passage to Gough Island.

weeded (notably potatoes, found adjacent to the catwalks and immediately below the crane). Blinds were fitted to all windows except one in the PWD store, for which a replacement had been ordered and was fitted during the relief.

During the inspection of the station we granted permission to land containers and materials on the vegetation adjacent to the water tanks. This led to some localised damage and trampling of the vegetation, especially immediately around the water tanks. One island tree *Phyllica arborea* was slightly damaged, but this was not serious. Three areas were identified for landing cargo: the helipad, crane platform and designated areas adjacent to the watertanks. We requested that use of the crane area be limited and be delayed as long as possible to allow it to be treated for *Sagina*. In the event no base cargo was landed at the helipad (which is the most suitable site, and the only site not in contravention of DEAT's policy of not landing cargo within 10 m of buildings); only the two scientific depots to be flown into the interior were landed at the helipad. Twelve containers were landed on vegetation east of the base, as were four loads of construction material and two cargo nets of fresh fruit and vegetables (see below). The bulk of the cargo (21 containers plus gas bottles and other NDPW equipment) was landed on the crane platform.

Prior to flying cargo or personnel, we briefed the SAAF crew, asking them to avoid flying over Seal Beach as well as other large penguin colonies and seal rookeries. This request was largely adhered to, but on the few occasions when the helicopter did fly over Seal Beach, there was no sign of overt disturbance.

Food

The following fresh fruit and vegetables were offloaded: courgettes, cucumbers, gem squash, pumpkin, onions, garlic, carrots, washed potatoes, tomatoes, apples, pears, pineapples, papaya, bananas, lemons, grapefruit, tangerines and oranges. There was no consultation regarding fresh produce other than a request immediately prior to sailing from Cape Town to allow for pineapples to be sent and have their leaves removed a day or so before reaching Gough. After consulting with colleagues, this request was denied, as the risk of introducing insects or other pathogens in the pineapples themselves was deemed unacceptably high. Despite assurances that this issue would be resolved, at least five boxes of pineapples were landed with their leafy heads still attached. Several courgettes and one pumpkin were mouldy, and other items were crushed in transit (tomatoes, oranges, apples). It is likely that helicopter downdraft effectively dispersed fungal spores from the mouldy items in the cargo nets (see section on aliens). In future all fresh produce should be loaded into containers for flying ashore. Landing the open produce direct onto vegetation was an avoidable hazard. As a matter of principle, environmental policies enforced by DEAT at Marion Island should be no more stringent than those applied at Gough; accordingly, we suggest that the complete ban on fresh produce being sent to Marion also apply to Gough Island.

Despite team members saying they had few problems with weevils in foodstuffs, a spot check revealed live individuals of two species in flour and pasta in the pantry during the initial inspection tour. Steven Chown and colleagues subsequently identified five species of beetles (from five families) in contaminated foods, including glace cherries!

New construction

The main external construction during the relief was the erection of a new tower for the buoy GPS antenna formerly housed in a dome on the upper-air building. This was necessitated by the need to

replace the upper air roof because of persistent leaks. Plans for the tower were pre-approved by GIWRAC, and the construction took place without incident. The new tower is enclosed on three sides by existing buildings, and only moved the dome a few metres from its original site. The only other external construction was the replacement of the water filter. The old gravel filter was removed, along with all used gravel, and replaced with a combination sand-charcoal filter. Use of coarse in-line pre-filters, plus a backwash facility on the new main filter should greatly reduce the need to import filter sand/gravel. The new filter stands directly beneath the water tower, reducing the footprint of the water supply system. The system also has been modified to always keep two of the four tanks (5400 l) in reserve, in case of upstream disruptions in water supply.

Removal of redundant structures

Three items were dismantled and removed from the island during the takeover: a disused aerial (ca 6 m) located east of the upper-air building, an old wooden piling located close to the 'new' magnetometer hut (already removed), and a sign erected next to Blechnum Bridge (outside the logistic zone). In addition, parts of the rhombic aerial array, which was supposed to have been removed in 1996 (Roux 1996) were located where they had been dismantled. The remaining material that was not entirely overgrown was collected and returned to Cape Town or Tristan. In future, all structures dismantled should be removed immediately to avoid twice disturbing the area (once during dismantling, and once during subsequent removal). The emergency radio shack and catwalk leading to it are no longer in use, but will only be removed in 2000 when personnel from the German project that used the hut visit the island to remove the last of their equipment (K. Booyse pers. comm.).

Wastes

In general, solid waste management on the island is conducted in a sensible manner, with plastics, glass and tins returned to South Africa for recycling/disposal, paper and wood being incinerated, and food wastes being disposed of into the sea via Skivvygat. The old incinerator continues to be used, despite plans for a new, more efficient, cleaner-burning diesel incinerator since 1997. A large quantity of waste wood was generated during refurbishment of the lounge in the Base, and was burnt in the incinerator. This was uneventful, as people were standing by with fire-hoses in case of problems.

Disposal of food wastes and base sewage into skivvygat is acceptable during most of the year, but the volumes of waste are much greater during takeover. A macerator for food wastes would be a great improvement at this time. Sewage and grey water also goes into the sea via Skivvygat. Attention needs to be given to educating team members and especially relief personnel not to dispose of oils and toxic chemicals (e.g. mineral turps) in the waste water system. Some people brought drinks to the island in plastic bottles rather than cans. These take up more waste volume, and are not readily recyclable; use of cans should be encouraged.

Fuel pumping

Approximately 70 000 litres of polar diesel were pumped ashore on 25 September. Pumping commenced around mid-day and was completed by 18h00. For the most part the transfer went off smoothly. There were some initial problems with the sleeve to protect the ship's line where it ran over the rocks to the shore-based junction box, and a rupture occurred at the junction box while the line was being tested. No diesel spilled as a result of the rupture, as the pipe was tested by pumping air through it. Approximately 10 l of diesel spilled when one of the storage tanks on the base overflowed. This was

dispersed over a considerable area by the wind, and no remedial action was taken to treat this small spill.

Helipad and catwalks

The new helipad is a significant improvement for everyone other than the skuas (who prefer the old structure for roosting – presumably because it's less draughty!) The old structure is still intact, although becoming overgrown with alien grasses (mostly *Poa annua* with some *Agrostis stolonifera*). There is no sign of pollution from the polystyrene underlying the old structure. It remains the best site for landing and storing containers.

The catwalks were in good condition, but some of the wooden support beams are rotten and need replacing. A previous report (Huysen 1997) suggested using either creosoted timber or recycled plastic beams when replacing the supports. We favour the latter option, provided they are structurally capable of the task.

Lights and night-strikes

In general, people were conscientious about closing blinds at night and not turning on outside lights. Some relief personnel had no idea why there were these regulations, and were much happier to comply once they understood the reason. This demonstrates the need for a visitors' guide to the island. Some of the blinds let light in at the sides, especially if they are not closed to lie flush with the window. In some rooms (e.g. the radio office), cardboard guide flaps have been put up by the team to prevent this problem; it could be applied throughout the base.

There was one incident where the helipad lights were accidentally switched on, and this was only discovered at 2h00, by which time many birds had been drawn to the lights. Some outside light switches have been taped in the off position (e.g. the quad light-switch in the pantry), but a more formal system of protection is needed to make it difficult to accidentally turn on any outside lights.

Alien plants

The discovery of *Sagina* at the base is probably the most serious alien introduction to Gough Island in the last 50 years, as it has the potential to spread extensively, especially in upland mires. Consequently every effort should be made to eradicate *Sagina* before it spreads too far. Niek Gremmen is producing a separate report on his survey, but the main findings are that *Sagina* is largely limited to the cliffs of the logistic zone (beneath the crane, at the diesel pump site, and a small patch below the crane control point), the cement platform at the crane and sections of cement path leading to the main base. Extensive spraying with 2,4 D (a broad-leaf herbicide to kill existing plants) and Weedmaster D (active ingredient diuron, to prevent germination of new plants) throughout these areas is hoped to be able to control the immediate problem, but repeated follow up is required. Sprayed plants still appeared fairly healthy, possibly because of low temperatures at this time of year (the herbicide has to be taken up by the plant to be effective). One disturbing discovery was of a seedling on the branch of an island tree along the path to Seal Beach. The locality suggests that it may have been dispersed by a Gough Bunting. A pair foraged regularly at the base of the crane, and one may have carried a seed to the site. This finding requires a more extensive search of the base environs for new plants over the next years.

The herbicides were transported to the island in containers, and spraying could not commence until they had been offloaded. Unfortunately it was deemed impractical to leave the crane platform free of

cargo, so this area was first treated with boiling water, and then all vegetation in the cracks between the cement slabs was removed by hand. This took all the scientific personnel on the island more than two hours from dawn until the first cargo arrived. At the end of the relief, the area was sprayed after backloading was completed. The Gough 44 team is commended for their efforts to control *Sagina* during the year, and the Gough 45 team have been given comprehensive instruction to continue spraying the affected area.

Other than *Sagina*, no new alien plants were observed. There was no sign of the novel plants introduced when the upper magnetometer hut was constructed. Potatoes *Solanum tuberosum* occurred at two sites at the base, were removed and were pointed out to the new team. The new team was also shown the other major alien plants (*Rumex obtusifolius*, *Holcus lanatus*, *Agrostis stolonifera*, *Poa annua*, *Plantago major* and *Sonchus* spp.), and asked to remove these where feasible in the immediate vicinity of the base, but not to devote undue effort to this task, as all are widespread on the island. Gough 44 weeded *Sonchus* around the base during the year, and it appears to be less common than in previous years. Niek Gremmen gave the new team a talk on alien plants, highlighting their impacts.

A new cause for concern is the occurrence of an apparent fungal infection on island trees *Phyllica arborea* which causes the foliage to turn yellow, wither and die. Close inspection revealed brown blisters on the leaves and matting of the stem and leaf hairs. Microscopic investigation found what appeared to be fungal hyphae penetrating the leaves. Single branches are affected on some trees, while in many cases entire plants are affected. Samples have been returned to South Africa with Steven Chown, but it may require a visit by a plant pathologist to isolate the fungus and identify its source and possible impacts on the tree population. At present, 'yellow' trees make up no more than 5% of the population, and appear to be limited to the southern part of the island. However, up to 20% of trees are affected at some sites. Members of Gough 45 will monitor 15 affected trees monthly along the path to Seal Beach to assess the rate of spread of the infection, and a further 50 healthy trees will be checked three-monthly for signs of infection.

Peat slips

On 22 March 1999 a cloudburst caused numerous peat slips. The base recorded 88 mm of rain, mostly from 12-15h00. The slips on the lower and middle slopes of South Peak were not as extensive as those resulting from the 1991 rainfall event (Ryan 1993), but there was much more severe impact on the upper slopes, with many slips on the slopes between 1760 and Mt Zeus. Two adult Tristan Albatross *Diomedea dabbenena* in the Tafelkop study colony (n=14 nests) were killed when their nests were engulfed in slips. The local streams came down in flood, augmented by the mud and vegetation load from the slips. The flood surge scoured stream banks and washed away some of the pipeline that supplies the base with water. The scouring also cut the route up Ruin Ridge used by the Gough 44 team to access South Peak and the interior of the island. After email discussions with members of GIWRAC, it was decided to reopen the old Tafelkop route via 'Golden Highway' until the situation could be reassessed during the takeover. Team members were warned to avoid visiting fresh slips as this increases the risk that they will be colonised by alien plants, especially grasses.

Much of the December 1996 peat slip next to the e-base/crane area is reasonably well-vegetated and more dramatic slips are not expected. However, the steep bank at the back of the slip, comprised of dry, friable peat, continues to erode slowly. This gradual erosion ultimately is likely to encroach on the former crane power shack.

Paths

We assessed four routes to South Peak: the two eastern ridges of Ruin Ridge, the route past 1760 and Tafelkop via the ‘Golden Highway’. The main Ruin Ridge route is heavily eroded on the upper, wet heath sections, and some of the steep sections lower down also were eroded. The other routes are steep and have been affected by slips. We decided that the classic ascent of Tafelkop was the best route. This will be enhanced if short, aluminium ladders can be installed to reduce wear on steep sections (e.g. descent into the Golden Highway, and the rope scramble above Golden Highway). Other places where ladders would be useful is the cliff to Seal Beach (which was heavily eroded during the relief given the large number of visitors) and the descent into and out of the second river crossing above Swemgat en route to Tumbledown and Richmond Hill. Kobus Booysse (DEAT coordinator) expressed a desire to see paths improved with the use of ladders; it would be useful if several ladders could be delivered to the island before the next relief, especially given the increase in path use associated with the biological programme on the island.

Relatively little hiking took place during the 1998-99 year (Table 1). The paths leading to Seal Beach/Swemgat, The Admiral and up towards Golden Highway were in good condition, albeit overgrown, at the start of the relief. By the end they were fairly heavily eroded in places, with deep mud pools and some ribbon paths developing. The new team was instructed to remain on paths wherever feasible, and to avoid cutting across slopes, especially at higher elevations. We showed members of the new team the approved route up Tafelkop and across to South Peak, and also tested the rope at Waterfall Point. The rope ladder at Admirals is still in good shape, but the one to Swemgat has a broken rung that requires repairing or replacing the entire structure.

Table 1. Numbers of trips made to various destinations during 1998-99. Units are number of people walking each route. Each trip is counted only once (i.e. a trip to Gonydale probably also includes an ascent of South Peak).

Destination	1998 relief	1998-99 year	1999 relief
Admirals/Snoekgat	25	21	42
Seal Beach/Yellow-nosed Albatross colony	25	57	52
Swemgat	25	19	15
Prion cave	5	2	5
Tumbledown (seal colony)	4	18	4
Richmond Hill/South Point	0	2	2
River/dam	9	27	12
Tafelkop/South Peak	8	17	10
Gonydale	8	9	7
Rowetts and beyond	0	8	4
Waterfall Point/The Glen	0	0	2

Coastal and marine issues

In August, an unlicensed fishing vessel was overheard on the radio and sighted 11 nautical miles offshore by a passing commercial plane that was alerted by base personnel. It is believed to have been a long-line vessel. Two adult Sub-tropical Fur-seals *Arctocephalus tropicalis* were seen entangled in litter: one in a piece of netting in November, and one with a packing strap in December. A fur-seal pup

was observed with a yellow rope collar at Waterfall Point on 24 September 1999. None of the entanglements was removed. No oiled or entangled birds were observed. A hook from a pelagic long-line (presumably targeting tunas) was found on the boulder beach at Waterfall Point. Presumably it had been brought ashore by a seal or a seabird.

Very little fishing by team members took place during the year. Snoek were caught on one occasion, but were not eaten when they were found to contain parasites! Limited fishing took place from the *S.A. Agulhas* while she was anchored off Gough.

Environmental monitoring and scientific activities

Belinda Enslin was conservation officer during 1998-99, and did an excellent job, maintaining detailed records of all activities outside the logistic zone. Antwa Lombaard, team leader of Gough 45, will act in this capacity during 1999-2000. In addition to ensuring that the base runs according to the policies of the management plan, the conservation officer also is responsible for coordinating volunteer monitoring programmes on seabirds (Yellow-nosed and Tristan Albatross study colonies) and seals (Subtropical Fur-seal pup growth and Southern Elephant Seal census) conducted by the team during the year. She will also supervise the *Sagina* control programme and monitor the spread of the apparent fungal infection in marked *Phyllica* trees.

During the relief we set up the Yellow-nosed Albatross study colony for the coming season, including putting new alpha-numeric colour bands on 86 birds. We also conducted the first complete island census of Tristan Albatross chicks since 1982. This entailed traipsing over much of the island, and we append a list of GPS fixes for the main peaks and necks on the island. We found using a GPS extremely useful in areas where we were not familiar with the terrain.

Despite the setback caused by the resignation of one of the expedition biologists, the invertebrate sampling programme got off to a reasonably good start. Both containers were flown to Gonydale on 11 September, and one was subsequently moved to the area adjacent to Waterfall Camp (south of Edinburgh Peak) on 25 September. Field sampling will be restricted largely to the southern third of the island until a second field biologist can be sent to the island. A series of aerial photographs of the base area was taken on the return flight from dropping the container at Waterfall Camp. This will be compared with the aerial photograph taken by Nigel Wace in 1984. In another attempt to monitor vegetation dynamics, PGR and Coleen Moloney resurveyed a 50 m vegetation transect on a slip on the slopes of Ruin Ridge (established in 1990), and set up a second transect on a slip from the 1991 flood near the Golden Highway. The new site has much greater cover of introduced grasses.

In addition to addressing the *Sagina* invasion, Niek Gremmen made a large collection of mosses, liverworts and lichens. These will be sent to museums in Poland, Germany and Norway, respectively, where they will be identified and available for further study. He also collected plant specimens for the Tristan studies collection.

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Gough GPS co-ordinates

Base (meteorological station)	40 20.93 S	9 52.83 W
Prion Cave	40 21.16 S	9 53.12 W
Richmond Hill	40 21.25 S	9 53.56 W
Admirals (top of rope)	40 20.77 S	9 52.72 W
Ridge above Haul-around Point	40 20.46 S	9 52.83 W
960' (highest point)	40 20.45 S	9 53.13 W
Golden Highway (top = junction 960/Tafelkop)	40 20.51 S	9 53.26 W
Waterfall Point (top of rope)	40 19.77 S	9 53.44 W
1760'	40 20.20 S	9 53.65 W
Tafelkop	40 20.34 S	9 53.72 W
Mt Zeus	40 20.52 S	9 54.44 W
South Peak	40 20.26 S	9 54.50 W
Michael's Col	40 20.06 S	9 55.04 W
South Rowett	40 19.96 S	9 55.50 W
Centre Rowett	40 19.76 S	9 55.58 W
North Rowett	40 19.36 S	9 55.78 W
Waterfall camp	40 18.82 S	9 56.33 W
Gonydale - path to base (top end)	40 21.06 S	9 54.33 W
Green Hill (peak)	40 20.69 S	9 55.54 W
South end of Green Hill ridge	40 20.99 S	9 55.28 W
Neck between Green Hill & West Rowett	40 20.37 S	9 55.61 W
West Rowett	40 20.12 S	9 55.85 W
Neck between West Rowett & Low Hump	40 20.07 S	9 56.14 W
West ridge of Low Hump	40 20.02 S	9 56.60 W
Spire Crag	40 19.59 S	9 57.56 W
East end of Alby Plain ridge (= baseline)	40 19.10 S	9 56.41 W
Edinburgh Peak (highest point)	40 18.66 S	9 56.82 W
Edinburgh Peak (eastern rim)	40 18.45 S	9 56.92 W
East end of Barren Dome	40 18.06 S	9 56.97 W
West end of Barren Dome	40 17.47 S	9 57.56 W
Neck between Expedition Peak and Nigel's Cap	40 17.98 S	9 58.02 W
Sea Hen Crag	40 17.78 S	9 58.77 W
Triple Peak (north-western peak)	40 17.21 S	9 58.95 W
North end of Long Hump (above Battle Bay)	40 17.64 S	9 59.67 W
West Point Hump	40 18.30 S	9 59.76 W
West spur of False Peak	40 18.96 S	9 58.49 W
Neck between Expedition Peak and False Peak	40 18.58 S	9 57.16 W
Inland end of Big Gulch	40 18.52 S	9 57.73 W
Gonzalo Alvarez (Expedition Peak)	40 17.98 S	9 57.74 W