ROSEATE TERN SPECIES RECOVERY PROGRAMME

Isles of Scilly
2004 Report

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1.0 Abstract

The 2004 Common Tern (*Sterna hirundo*) breeding season in Scilly can be regarded as something of a success. The food shortages experienced at tern colonies in the northern United Kingdom (Townsend & Sadler, 2004) were not felt in Scilly, with food being provisioned at an average rate of 0.75 food items per pair per hour over the breeding season.

Although the number of known breeding pairs of Common Tern in Scilly declined again in 2004 (76 pairs, as opposed to 86 in 2003) the overall productivity was greater. The small scale habitat management work, the provision of tern shelters, and the removal of gull nests from tern colonies, all aided a minimum of 46 chicks to fledge. This yields a productivity ratio of 0.59 chicks per pair, greater than the 0.43 ratio experienced in 2003, but still below the 0.66 figure needed to maintain a stable population (Radcliffe, pers com).

A total of seven colony sites were used this year, though the majority of birds (minimum of 60 pairs) eventually chose North Hill, Samson to breed. This happened after the unexplained abandonment of ten pairs from the Appletree Banks, Tresco colony site in late May, which had looked like being the largest colony in 2004. The Annet colony remained deserted all summer despite extensive habitat work to make the potential breeding area larger. As in 2003 a number of rocky offshore islands were used, generally unsuccessfully, by small numbers of breeding pairs. Green Island, Samson held just two pairs in 2004 compared to at least 25 in 2003.

A total of 30 custom built tern shelters (based on the design successfully used at Coquet Island, Northumberland) were placed at three different colony sites. Ten tyres and numerous stone and driftwood shelters were also made to provide more cover at these three colonies. While a total of 8/10 new nest boxes, 13/15 old nest boxes, and 3/3 tyres placed on North Hill, Samson were used in 2004 there were not enough boxes/shelters present to provide for the number of breeding pairs at the colony.

Predation of eggs and chicks, and the number of mobbings observed, showed a marked reduction in 2004 from 2003. This was undoubtedly due to the continued destruction of gull nests and eggs from the vicinity of tern colonies. A total of 37 gull nests containing 51 eggs were destroyed, mostly of Lesser Black-backed Gulls (*Larus fuscus*) nesting on North Hill, Samson.

Human disturbance was at an increased level in 2004. An extended area was fenced on North Hill, Samson to include all the breeding terns present, but this was noted being violated on at least five occasions, mostly by local residents of Scilly. Human disturbance presumably accounted for the abandonment of the Appletree Banks colony in May.

For the second year running a lone pair of Sandwich Tern (*Sterna sandvicensis*) nested unsuccessfully in Scilly, this time on Peashopper Island. At least two Arctic Terns (*Sterna paradisaea*) were present this summer, and one bird (presumably the same bird as in 2003) unsuccessfully courted a Common Tern throughout the season. A Little Tern (*Sterna albifrons*) was observed fishing off the north shore of Samson on 22nd June. Single Roseate Tern's (*Sterna dougallii*) were reported on three dates, though none were seen by the Tern Warden, and for the tenth year in a row no breeding was suspected.

1.1 Introduction

The Roseate Tern has nested in Scilly since the early 1840's, but numbers began to decline in the 1990's when there were six to eight pairs present most years (ISBR, 1990-94). These small numbers made up 10% of the English population. The Roseate Tern was at this time regarded as Scilly's most important breeding bird species. It last bred in Scilly in 1994, and the reasons for its abandonment are unclear, but disturbance, avian and mammalian predation, and a lack of suitable nest sites may all have played a part in its sad demise. Since 1994 the Roseate Tern has been a scarce summer visitor, averaging a handful of record each year (ISBNHR, 2001). The Roseate Tern nests in association with other tern species and in Scilly the Common Tern in particular. The number of breeding pairs of Common Tern in Scilly has undergone a near 50% decline in the last 30 years (ISBR 1970-1999; ISBNHR 2000-2002). Reversing the decline of the Common Tern by establishing a productive colony is seen as an integral part of the Roseate Tern Species Recovery Programme (RTSRP) on the islands.

The Nature Conservancy Council (NCC) carried out seabird monitoring in 1974 and 1987 focusing primarily on determining population sizes for various seabirds, including tern species, around Scilly (ISBR, 1974, and 1987). These studies detected local increases and declines in the tern population but provided little information on causes. In 1992 English Nature (formerly NCC) began systematic survey work on both Common and Roseate Terns (Robinson, 2000). This identified the pressures of predation by rats, and possibly cats, on terns around Scilly. A trial clearance of rats on Samson in the winter of 1992/93 proved successful, and was extended to a number of other offshore sites, and continues up to the present day (Mawer, pers. comm.). The 1992 survey work highlighted the problem of the exposed nature of rocky, offshore sites to wind and high tides. The following year work commenced on the application of sand to some offshore rocks preferred by breeding terns with encouraging results. Although there were increases in both laying pairs and hatched chicks, such concentrations of young terns brought increased predation from gulls (ISBR, 1992). The work also attempted to reduce predation from gulls with the provision of nest boxes at two sites. Two pairs of Roseate Tern used these boxes, with one pair raising two young (ISBR, 1992).

In the year 2000 the Isles of Scilly Environmental Trust (now the Isles of Scilly Wildlife Trust), English Nature (EN), and the Royal Society for the Protection of Birds (RSPB) established a Roseate Tern Species Recovery Programme (RTSRP) for the Isles of Scilly. In 2000-02 English Nature contracted the Channel Seabirds Group (CSG) to run the programme based on North Hill, Samson. North Hill has historically had small numbers of breeding terns (including Roseate) and was thought to offer the best location for a productive tern colony (Robinson, 2002). The CSG attempted to encourage the formation of a Common Tern colony via the aid of nest boxes, a solar powered CD lure device, and dummy terns during the breeding season. This was reasonably successful in encouraging Common Terns to the site; with ten pairs in 2000, 25-36 pairs in 2001, and 15 pairs in 2002 (Robinson, 2000-2002). Limited monitoring of other historical tern breeding sites was carried out by the Isles of Scilly Bird Group (ISBG) in 2002, and it became clear that a more in-depth study was required. In 2003 English Nature funded the IOSWT to employ a Seasonal Tern Warden for Scilly to monitor tern distribution, productivity and causes of decline for the whole archipelago. This report highlights the findings of the second years study.

2.0 Colony Management Measures

In his book "Endangered Species Management" Snyder (1978) suggests that nest-site limitations can result from three major causes: (1) an intrinsic scarcity of adequate nest sites relative to other necessary resources, (2) behavioural limitations in the abilities of the species to locate what nest sites may exist, and (3) vulnerability of nest sites to competitors and predators.

For the colonial nesting terns of Scilly nest-site limitations are due to causes (1) and (3), where perfect nesting habitat does not currently exist, and those areas favoured at present are also used by competitive and predatory gulls. Management work in 2004 aimed to begin to alleviate these problems. All colony management work was carried out in late April/early May at least two weeks prior to the arrival of Common Terns in Scilly.

2.1 Tern Shelters

Objective 2.2.5 of Birdlife International's East Atlantic Roseate Tern Action Plan (2002) states "provision of nest boxes or other structures to provide cover for nests, incubating birds, and chicks is of medium priority". It further states "an adequate number of nest boxes based on RSPB design, should be sited at colonies where there is little or no cover from aerial predators. Alternatives such as discarded tires may be suitable in some situations".

There have been many studies proving the effectiveness of different design nest boxes and types of tern shelter in increasing productivity in terns (e.g. Burness and Morris,1991; Parken, 2000; D'Eon, 1995; Newton and Crowe, 2000).

At tern colonies in Scilly in 2003 many chicks and eggs were lost to bad weather and predation by gulls. This was due to the open, exposed nature of many colony sites, which meant chicks had to travel long distances to find suitable cover and thus increasing the risk of exposure and predation. Spendlow (1993) found that compared to those that moved to new hiding places, chicks that stayed close to their nest were, 1) less vulnerable to attacks by predators and neighbouring terns, 2) less likely to become separated from their parents, and 3) more likely to survive to fledging. He found that 80% of pairs nesting in modified sites produced at least one chick, compared to 64% in natural sites.

Dr. Paul Morrison, RSPB warden on Coquet Island, Northumberland, kindly advised on the design of nest boxes, and brought a model plywood box with a sloping roof, and side entrance to Scilly in April 2004. This design has proved to be the most attractive to Roseate Tern's, and the most successful at protecting chicks on Coquet. A study at Falkner Island, Connecticut (Spendelow, 1993) trialled three different design Roseate Tern nest boxes, to determine which nest sites held the chicks for longest after hatching and thus increased likely chances of survival. Spendlow also found that plywood nest boxes with a side entrance were the most effective at increasing productivity. ***See Appendix II for design of nest boxes.***

The design of boxes is important so that chicks feel safe, predators cannot access them, and that there is room for adult terns. There are currently 15 old nest boxes placed on North Hill, Samson in 1992 (ISBR, 1992) but while the design of these provides cover for tern chicks, they do not allow access for adult terns, particularly Roseate (Morrison, pers com).

So, in 2004 it was decided to trial a small number of different tern shelters to try and increase tern productivity in Scilly. Ten boxes were placed on each of the North Hill, Samson (on 29th April); Appletree Banks, Tresco (on 23rd April); and Annet (on 26th April) colony sites, with a further two placed on Peashopper (on 12th May). Seven tyres were donated by Nike Engineering and three placed on North Hill, Samson; three on Annet, and a single on Peashopper. The Tresco Estate donated four tyres, which were placed in the Appletree Banks colony area. Holes were drilled in the bottom of tyres to allow for rainwater drainage. A number of stone and driftwood shelters were also created using materials found around colony areas.

The distances between boxes is important and must try to limit overcrowding and intraspecific competition. Erwin (1977) reported a mean nearest neighbour distance of 160cm for a Common Tern colony, where as Burger and Gochfeld (1991) found the minimum distance between nests to be just 44 cm (though the mean ranged from 100 – 300 cm). As a result tern shelters were placed at least five feet apart.

Figure 1: Tyres (top left) and Roseate Tern nest boxes (top right) were placed on Peashopper, Appletree Banks, North Hill and Annet; while additional stone shelters (above left) and drift wood shelters (above right) were placed on Appletree Banks and Annet.

Tern shelters should bring three benefits to terns in Scilly:

- Provision of cover from rain, and shade from sun
- Hiding places from passing predators in exposed areas
- Suitable nesting habitat for Roseate Terns.

Adult Common Terns nesting on North Hill, Samson in 2004 used shelters as vantage points while resting in the colony, and for courtship, while tern chicks used them for shelter from the elements and predators. In total 8/10 Roseate Tern nest boxes, 13/15 old nest boxes, and 3/3 tyres placed on North Hill, Samson were used in 2004, and undoubtedly helped increase productivity this year.

2.2 Habitat Management

2.2.1 Annet

On Annet the size of suitable habitat for breeding common terns is small (0.13 Ha in 2003) and prone to the encroachment of bracken over the course of the tern nesting season. In 2003 the area was thought to be at its carrying capacity for breeding terns and it seemed unlikely that many more than the 20 pairs present could fit in the area. In 2004 ways of increasing the size of the breeding area available were looked at and implemented. Habitat work on Annet has several logistical problems associated with it, such as the impossibility of landing heavy machinery there, and the timing of herbicide treatment might coincide with the tern breeding season. Therefore other alternatives had to be looked at.

Landscape fabrics were effectively used at Eastern Egg Island, Maine, where two 15m x 4m plots were covered by the fabric and secured to the soil surface with rocks. Holes were cut in the fabric to allow large rocks and vegetation to protrude and 10cm of wood chippings were placed on each plot. Forty five pairs of Common Tern bred on the site within six weeks. Although wood chippings decomposed or blew away in a single season, the fabric was still present six years later with sixty five pairs of terns nesting on the plots (Kress, 2000).

On North Brother, Nova Scotia where vegetation reduced tern productivity two 9ft x 12ft tarpaulins were placed over areas, and covered with beach gravel and nesting structures. Initially the number of terns nesting on the area was less than hoped, and vegetation had invaded the area by later in the season. However two years later, each tarpaulin held six Roseate Tern nests (D'Eon, 2003).

Figure 2: The 2003 Annet breeding site is the green area below the boulder beach, the black plastic was placed adjacent to this, and the foreground was scythed and racked (above left). The black plastic was buried and covered with shelters (above right).

With this in mind, three different techniques were employed on Annet to try and limit bracken growth:

- An area of 10m x 4m was covered with black plastic, topped with a layer of earth and sand.
- A 10m x 4m area of Bracken was scythed and raked.
- A 10m x 4m plot was scythed and raked and then the top 20cm of soil was removed, hoping to break the rhizome structure underground. This soil was weeded and then placed on the black plastic plot.

The area available for nesting terns on Annet was successfully increased from 0.13 hectares in 2003 to 0.28 hectares in 2004 using these techniques. However, vegetation grew rapidly throughout the season, though more sparsely than previously. Quadrat samples of the managed areas were taken to determine the density of bracken pre and post management in the plots. Initially the bracken coverage was 100% in these areas. The area that had been scythed, raked, and the topsoil removed had 50% bracken coverage six months after management. The black plastic plot held just one small patch of bracken where it had broken through the plastic, and coverage was 0.1%. And the scythed and raked plot showed 80% bracken coverage. In all managed areas the bracken height was lower than in surrounding control areas.

Figure 3: Annet colony area during habitat work in April 2004 (top left), in mid June 2004 (top right), and in early September 2004 (left). The black plastic covered plot (right) successfully reduced bracken cover and should offer additional tern breeding habitat.

The black plastic plot was successful in reducing bracken growth and in providing improved habitat to breeding terns. By September a few plants had colonised the area and the soil had settled and was very similar to the area actually occupied by terns in 2003. The wind had blown some of the earth away and plastic was exposed in a few places, this will require covering in spring 2005. Unfortunately no terns nested at this site in 2004, though odd birds were seen fishing offshore, but none were seen to land during May and early June. Members of the St. Mary's Boatman's Association monitored the site during their daily Annet Puffin trips, and terns were notable only by their absence.

Considering the success of the plastic plot in reducing bracken cover, it is suggested that the technique should be extended so that it joins up with the existing colony site. This would mean covering an area of approximately 20m x 10m with black plastic in early spring 2005.

See Appendix III for maps of work and species present on Annet.

2.2.2 Samson

It had been noted in 2003 that Common Terns favoured nesting in areas of low vegetation, earth or the boundary between rock and heather. A similar situation occurs on Coquet Island were Common, Arctic and Sandwich Terns favour nesting in areas that have been strimmed to ground level (Morrison, pers com). Cramp et al (1985) state that Common Terns usually choose bare ground or short grass to nest in, but occasionally persists on areas where grass or shrubs have grown up. They further say that the Common Tern avoids sites exposed to strong winds and heavy rainfall, stands of dense or tall vegetation, and precipitous or broken terrain.

Figure 4: Small areas of cleared ground (above) were created around nest boxes on North Hill, Samson to create optimum Common Tern nesting habitat.

The first visit to the North Hill site on the 29th April found the old nest boxes already in place to be very overgrown and with the entrances impassable. Areas of heather were cleared around tern shelters aiming to provide ideal habitat for nesting terns. The hope was to encourage them to nest as close as possible to shelters, and thus minimising the distance vulnerable chicks have to travel to cover. This proved successful and ten pairs nested on cleared ground in close proximity to nest boxes.

In hindsight these areas could have been further improved by being covered in sand to improve drainage, and allow better nest scrapes to be constructed. The provision of small amounts of nest material (such as grass cut from on site) would also have aided nests to be better protected. Further areas should be cleared around any nest boxes placed in the future, and the whole site should be monitored periodically to ensure that vegetation growth does not become too advanced.

3.0 Common Tern Breeding Summary

The list of 21 historical tern-breeding sites provided by Will Wagstaff in 2003 was again the basis of the study. Reports and sightings from these locations were made during the summer by the Tern Warden, members of the Isles of Scilly Bird Group, the public, and the St. Mary's Boatman's Association. This collaborative monitoring enabled the number of birds at each locality to be noted at least once a week.

As in 2003, every nest discovered in Scilly in 2004 was marked, visited at least once a week, and monitored until completion. Nest markers were two-foot long bamboo poles with a laminated number attached to the top. These poles allowed large numbers of individual nests to be monitored from a distance without disturbing breeding pairs.

The North Hill, Samson colony eventually held 80% of the breeding terns in 2004. Initially the choice of colony sites had looked similar to 2003, with small numbers around North Hill, and early nesters choosing the Appletree Banks area of Tresco. At least ten pairs unaccountably deserted this site during the egg laying stage at some time on Friday 28th May. These birds had moved to Samson by Sat 29th May and were followed by the thirty pairs that had been courting in the Green/Skirt Island area of Tresco. By Sunday 30th May there were eighty terns present on North Hill and numbers built up to a peak of at least 120 birds at this site later in the summer.

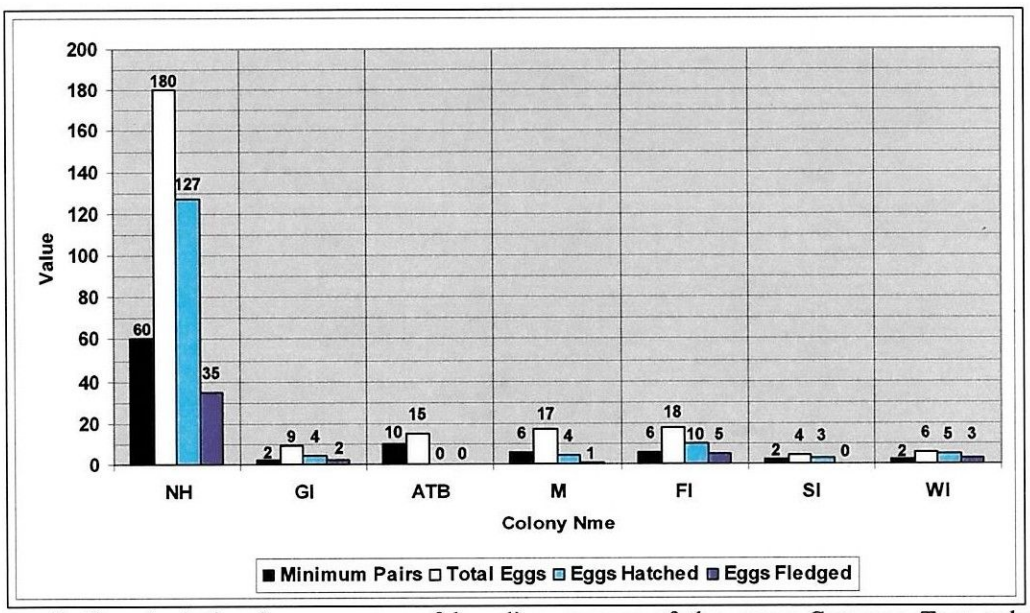

Figure 5: Bar chart showing summary of breeding success of the seven Common Tern colonies discovered in Scilly in 2004. Colony names are summarised as follows: **Samson**; NH = North Hill, GI = Green Island; **Tresco**; ATB = Appletree Banks, M = Merrick, FI = Foreman's Island, SI = Skirt Island; **St. Martin's**; WI = White Island

Of the smaller colonies discovered all were on rocky offshore islands with scant vegetation, and limited human access. Historically these sites have held small numbers of pairs each year, but they are prone to bad weather, high tides, and predation due to lack of cover, and therefore prove unproductive (ISBR, 1970-2002). The same was true in 2004; with the nests and eggs of six pairs on Merrick being washed away in the storms of the 22nd June. However, in 2004, the terns nesting on the Foreman's Island complex showed a high productivity rate for the second year in a row, suggesting this colony site is currently the most consistent in Scilly.

3.1 Nest Construction

Nest construction is a critical factor affecting reproductive success. (Burger and Gochfeld, 1991). Marple and Marple (1934) studying Common Terns in Poland found 54% of nests on bare ground or in the scantiest lowest scraps of vegetation. In this study just 4% of nests were totally unlined, 28% had a slender rim of material, 58% had both a rim and a thin base, and the remaining 10% had a rim and substantial base.

In Scilly nest material was limited or absent in nests in most cases. Terns nesting on North Hill, Samson generally failed to create much of a nest at all, using only bits of dead heather left from the habitat management work, and small amounts of lichen. Nest on the rocky offshore islands tended to be more impressive affairs, particularly on Green Island, Samson, and White Island, St. Martin's where large nests were built perhaps in response to the threat of tidal flooding. This would follow Burger and Gochfeld's (1991) findings that Common Terns can avoid tidal flooding by selecting nest sites that are on high parts of islands or by behavioural means such as the use of floating mats, construction of tall nests, or movement of vulnerable eggs and chicks. ***See Appendix I for photo comparison of Tern nests at different colonies in Scilly.***

3.2 Clutch Size

Nisbet and Welton (1984) state that "the early part of the season appears to be the preferred period for nesting by Common Terns, older birds lay consistently earlier than younger birds, and the earliest nesters lay the largest clutches and the largest eggs, and in the absence of predation they are consistently the most successful."

	Total		North Hill		UK	Russia	Coquet
	2004	**2003**	**2004**	**2003**	**1972**	**1960**	**2004**
4-egg nest	1%	0%	1%	0%	0%	2%	0%
3-egg nest	75%	47%	75%	75%	59%	77%	64%
2-egg nest	16%	30%	15%	25%	37%	16%	23%
1-egg nest	8%	23%	9%	0%	4%	5%	13%
Mean Clutch	**2.68**	**2.24**	**2.69**	**2.75**	**2.65**	**2.88**	**2.5**

Figure 6: Table showing clutches sizes of Common Tern in Scilly 2003-2004, and those given in Cramp et al. (1985), and from Morrison (pers com).

Eighty eight nests were found and followed to completion in 2004, with a further nine suspected but not discovered. 107 nests had been discovered in 2003, including at least 20 relays. 3-egg clutches predominated in 2004 as there were fewer relays this year due to the lower level of egg predation than in 2003. North Hill Samson shows consistency in clutch size in the two study years. Mean clutch size was 2.68 eggs per nest for Scilly as a whole in 2004, compared to 2.24 eggs per nest in 2003.

57% of 3-egg clutches were thought to have fledged at least one chick, and there were four pairs known to have fledged two chicks. 43% of 2-egg clutches fledged at least one chick. Single egg clutches were abandoned in all cases, though some were certainly incubated for a time, suggesting that the adults involved were young, possibly first time breeders.

Cramp et al. (1985) states that for a single Common Tern chick there is a 62% fledging success rate. With two chicks, success is 84% for the first and 57% for the second. For broods of three, the first has 89% chance, the second 77% and the third just 22% chance of fledging.

3.3 Timing of Egg Laying

The first sighting of a Common Tern in Scilly in 2004 was of a single in the Roads on 16th April. Thereafter up to forty migrant birds were around the islands until the 12th May when, as in 2003, around 80 breeding Common Terns arrived on mass in the Guther's/Craggy Ellis area. In 2004 breeding terns were very flighty on arrival, and there were three occasions in mid May when large numbers of tern were present at suitable breeding sites and egg laying seemed imminent, but this would be followed by periods of three or four days when there seemed to be very few terns around at all.

Figure 7: Breeding terns arrived on mass on the 12th May (above). As in 2003 they favoured the Guther's and Craggy Ellis areas to roost.

The first nest was discovered on North Hill, Samson on the 25th May, and the last on the 25th June. This is slightly earlier than in 2003 when the first nest was discovered on 28th May. However, this is two weeks later than breeding by Common Tern's on Coquet Island in 2004, some 500 miles to the north of Scilly (Morrison, pers com). The reason for the late start in Scilly compared to other UK colonies remains a mystery. Perhaps Scilly terns undergo a particular arduous migration and upon arriving in Scilly take longer to feed up and reach breeding condition?

In 2004 the North Hill colony showed a high level of synchrony with 76% of eggs being laid in the 10-day period between 25th May and 4th June. If eggs are incubated consistently they hatch within 21 or 22 days, and if there is disturbance it may take 25 or even up to 31 days (Cramp et al., 1985). Of the earliest nesters one nest took 26 days to hatch, and another 29 days suggesting that disturbance may play a part at this site. 32 nests were discovered on the 30th May and the majority of these had hatched within 21 or 22 days. Due to this high level of synchrony hatch dates were condensed, and the majority of chicks fledged at the same time. This did have the effect of causing at least ten pairs of late breeders to abandon their nests as the rest of the colony moved to the beach to feed newly flying chicks. As in 2003 the earliest layers in 2004 proved the most productive.

Feare (1976) found that on Bird Island, Seychelles 90% of the Sooty Tern eggs in a colony of approximately 400,000 pairs were laid in a nine-day period. He found this to be critical in terms of fledging success. Eggs laid during peak laying produced more chicks of fledging age, and chicks that were heavier and fledged earlier, than chicks from later eggs. Higher survival of peak-season eggs and chicks was attributed to reduced predation, and to reduced aggression/interference between neighbours that were all at the same stage of the breeding cycle.

3.4 Egg Outcomes

Hume (1993) states that for Common Terns, unless there is some unexpected factor, (e.g. sudden storm or mass predation) 90% of eggs hatch and 69% of the chicks that hatch survive to fledging. In 2004 in Scilly 60% of eggs hatched (compared to 57% of eggs in 2003) and of these 20% fledged (as opposed to 15% in 2003). Predation rates of eggs showed a marked decrease in 2004. Gull nest removal around tern colonies undoubtedly helped and the Annet site that experienced high levels of egg predation in 2003 remained unoccupied in 2004. The remaining egg predation was experienced at Skirt Island, Tresco where two nests were lost, presumably to gulls.

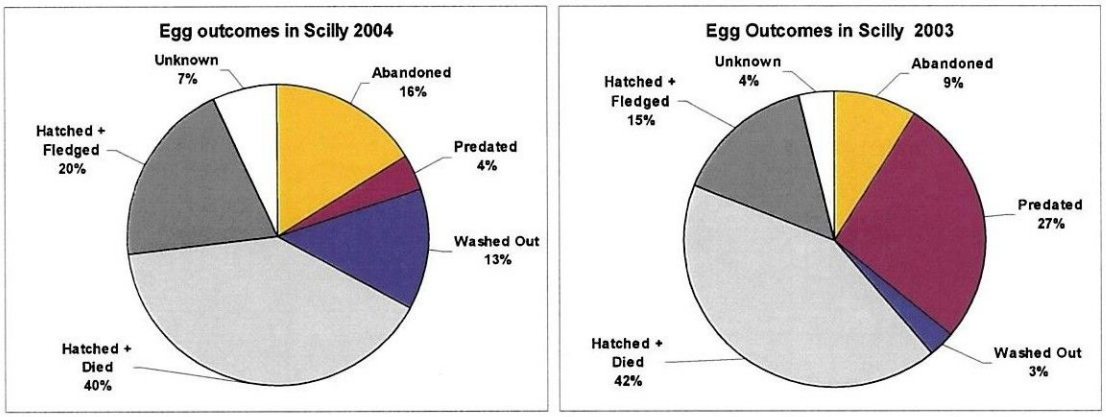

Figure 8: Pie Charts showing comparison of egg outcomes in Scilly in 2003 and 2004.

The higher number of abandoned eggs in 2004 can be explained by late breeders on North Hill leaving nests once the majority of the colony had fledged chicks and moved young to the Samson flats. In many cases two eggs from a three-egg clutch would hatch and the third egg would be abandoned once chick feeding had begun.

The storms of the 22nd June caused 16 out of 17 eggs on Merrick to be washed away, but the remaining egg hatched and fledged. A high tide on the 8th June destroyed a single 3-egg nest on Green Island, Samson.

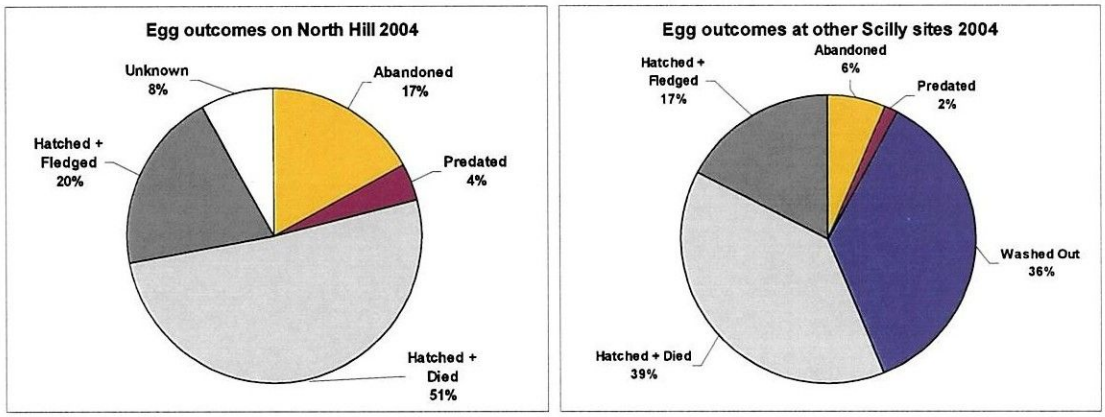

Figure 9: Pie Chart showing egg outcomes at North Hill, Samson and other sites in Scilly in 2004.

Predation rates of eggs on North Hill fell from 23% in 2003 to just 4% in 2004 due to the increased number of breeding pairs at the site and the resultant increased success at fending off predators that being in a larger colonies bring (Hernandez-Matias and Ruiz, 2003). The removal of twenty-four gull nests from the vicinity of the colony also helped to keep gulls away.

3.5 Productivity

The number of chicks fledged per pair in Scilly showed an increase in 2004 over 2003. A minimum of 46 chicks were known to have fledged in 2004. This yields a minimum productivity ratio of 0.59 chicks per pair, up on the 0.43 ratio experienced in 2003, but still below the 0.66 figure suggested by the RSPB to maintain a stable population (Radcliffe, pers com).

However, there was undoubted progress this year and the majority of birds benefited from nesting in the same location. It is interesting to note the similarity in productivity between Coquet Island and Scilly (0.57 and 0.58 respectively). While the 2004 season in Scilly was an improvement, the Coquet breeding season was regarded as disastrous with Common Terns at this site usually reaching a productivity ratio of at least 1.0 chick per pair each year (Morrison, pers com). Scilly has a long way to go to reach these expectations.

	Isles of Scilly			Other Sites			
	2003	2004	NH, 2004	UK	Finland	Germany	Coquet
Total Nests	100	87	67	420	-	-	30
Total Eggs	239	233	180	-	152	468	75
% Hatched	57	60	71	90	80	77	-
% Fledged	15	20	20	62	47	44	-
% Hatched Fledged	26	33	28	69	59	57	-
Productivity	0.43	0.59	0.58	0.9	1.46	1.6	0.57

Figure 10: Showing productivity of Common Terns in Scilly 2003-2004, and from other selected sites. * Figures for UK (1972), Finland (1973), and Germany (1970) taken from Cramp et al. (1985). Figures for Coquet (2004) from Morrison (pers com).

Egg predation was substantially less in 2004 than in 2003. The reduced predation, and number of mobbings observed on North Hill was due to the continued removal of gull nests from the site, and the large number (in Scilly terms) of terns present. These factors helped to reduce the proximity and number of gulls breeding nearby. Hernandez-Matias and Ruiz (2003) found that as soon as colonies of over forty pairs of terns were formed predation levels of nests reduced to around 10% as opposed to between 30-50% in colonies of less than eleven pairs. Therefore the probability of predation decreased greatly when terns bred in large groups. This seemed to be true in Scilly in 2004.

The total number of fledged chicks would have undoubtedly been higher had it not been for a period of gale force winds and torrential rain between the 22nd and 24th June which unfortunately coincided with the majority of eggs hatching on North Hill. A colony check on the 25th June found fifteen dead chicks, and the true total probably accounted for a third of all the chicks at this site (this is reflected in the low percentage fledged figure in the table above). The timing of the storm was unfortunate, as until chicks are five days old they do not move far from the nest scrapes, after this age they are much more mobile (Cramp et al., 1985). As chicks were below five days of age when the storm hit very few made use of the tern shelters positioned nearby.

4.0 Summary of Individual Colony Sites

A literature review was carried out in 2004 to determine historical site occupancy and breeding numbers around Scilly. The literature is patchy at best but using a number of books several breeding totals for some currently occupied sites were determined. Any figures that are given in the individual colony sites summaries relating to historical breeding numbers are taken from the following sources:

Rodd E. H. (1880); Quick, H. M. (1964); Penhallurick, R. D. (1969); Penhallurick, R. D. (1970), Isles of Scilly Bird Reports (1969 – 1999) Isles of Scilly Bird and Natural History Review(2000-2002); Robinson, P. (2004).

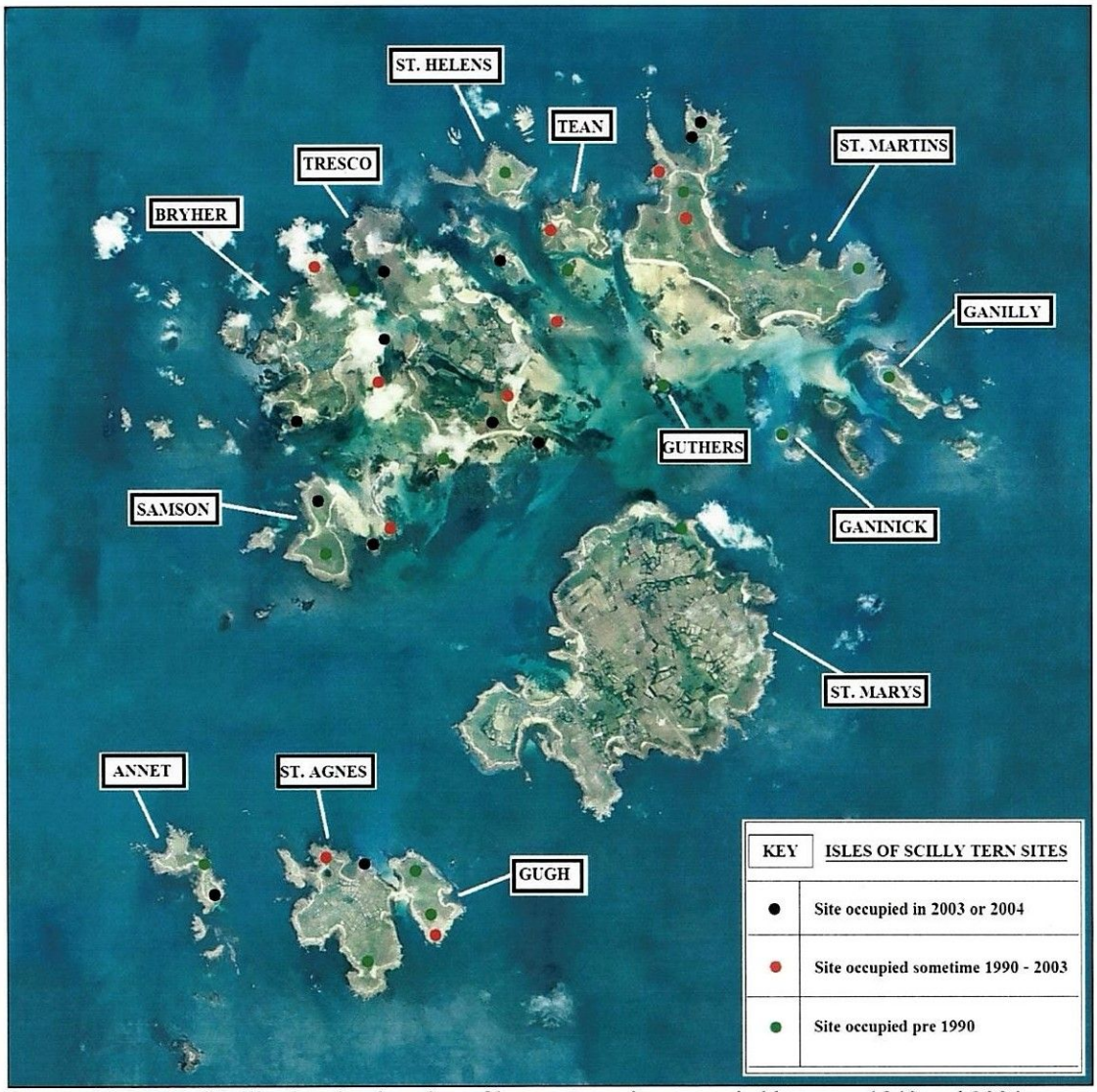

Figure 11: Map of Scilly showing location of known tern sites occupied between 1840 and 2004.

A review of this literature reveals a total of 37 sites were recorded as being occupied by terns at some point from 1840 to 2004. Several sites have not been used for a number of years; though perhaps point to possible future breeding sites. Interestingly a pair was noted nesting on St. Mary's in 1969 and two pairs in 1974.; St Helen's was occupied in 1953 and 1974; Great Ganilly and Great Ganinick in 1953; the Daymark, St. Martin's in 1974; Guther's in 1914 and 1953; and finally Hangman's Island was reported as "often" used by Quick in 1964.

4.1 North Hill, Samson

Terns were recorded breeding on North Hill on six occasions between the years 1982 and 2004, with some pairs also reported nesting on South Hill in 1991 (ISBR, 1991).

In 2004 the tern colony was situated in the same location as in previous years (Grid reference SV 877130). A total of 67 nests were found, marked and followed to completion, with a further six suspected but not discovered. In total 180 eggs were laid, and of these 71% hatched, and 28% of those that hatched survived to fledging. The thirty five fledged chicks produce a productivity ratio of 0.58. Nest monitoring data suggests that up to forty five chicks may have fledged from this site, though the productivity ratio is based on the number of directly observed fledged chicks. The poor survival rate of chicks was attributed to the storms between the 22nd and 24th June which came at an unfortunate time as chicks were small and unable to move to shelters. Had this event occurred a week earlier/later then fledging success would have been significantly higher.

Figure 12: Map of Samson and surrounding area showing species distribution and human disturbance.
* Human disturbance incidents are either where human activity prevented terns from using the site, or where human activity disturbed terns that were already present.
** Storm Petrel remains were found on Samson. As far as I can tell there are no previous records of this species from here.
*** At least another four Oystercatcher nests were suspected, the map only shows nests that were found.

While the majority of nests were situated on the western facing slope of North Hill, as opposed to the more sheltered eastern facing slope, many chicks were lead to the eastern slope at approximately two weeks of age (perhaps in response to the bad weather). This represented a move away from the nesting gulls, and to an area where there is more natural cover for chicks (in the form of longer grass, rocky areas, and gorse), as well as being nearer to the favoured fishing grounds of the Samson flats and Tresco channel. By the 18th July the majority of chicks had left the colony and were situated on the rocks of the Samson flats.

Terns nesting on the eastern slope are more prone to human disturbance as they are in the line of sight of the path skirting North Hill. This proved a problem and human presence caused terns to spent extended periods of time away from nests. ***See section 6.3 Human Disturbance for more details.***

Just 4% of eggs on North Hill were thought to have been predated in 2004 (presumably by gulls). Levels of chick predation were hard to measure but certainly occurred, with feathers and apparently predated chicks found on North Hill on three dates. It is possible these chicks had died a natural death and had been eaten by scavengers afterwards. Dead adult terns were found within and around the colony on five occasions, their remains being consistent with those left by a falcon. ***See section 6.2.4 Other Predators on Samson for more details.***

While tern shelters proved successful in providing cover for chicks, there were not enough boxes/shelters to provide for the number of breeding pairs present in the colony. Due to the territorial nature of nesting terns occupation of boxes can be at best one pair of breeding terns per box. At present the fifteen old nest boxes, ten new, and three tyres represent a provision of cover for less than half the breeding pairs present. The building and placement of nest boxes is time consuming and costly, and correct positioning of boxes is an inexact science as it is hard to predict the locations and numbers of breeding birds in advance.

Simple, smaller A-frame shelters as shown in the paper by Burness and Morris (1991) would be cheaper to build, easier to transport, and less time consuming to place, while still providing chicks with shelter in exposed areas. These shelters were constructed of rectangular pieces of plywood (approx. 12.5 x 25.0 cm) nailed together to form an "open-ended tent" with a peak about 10cm from the ground. This may prove to be a more effective strategy by ensuring maximum usage of artificial shelters, as they can be placed once colonies are formed, exact numbers of breeding birds known and eggs are approaching hatching. The placement of such shelters should not cause increased tern warden disturbance as they could be placed during weekly nest checks. Terns do not seem to be adverse to shelter boxes, and nest markers, being situated close to nests, in fact they offer favoured lookout posts for resting birds.

Of interest, on 25th June a 1st summer Common Tern was watched over the North Hill colony in chasing display flight with an adult Common Tern with fish before drifting off to Green Island. It was not seen again, but its arrival coincided with the southerly storms and the arrival of both a Little and Roseate Tern on Samson.

4.2 Green Island, Samson

Historically Green Island, Samson has proved to be the most regularly used colony site in Scilly (e.g. Quick, 1964; ISBR, 1979, RTSRPR, 2003). In 1969 Penhallurick wrote "the few figures for the 1920's and 1930's for better known sites such as Green Island are much larger than for recent years." This is reflected in the graph below.

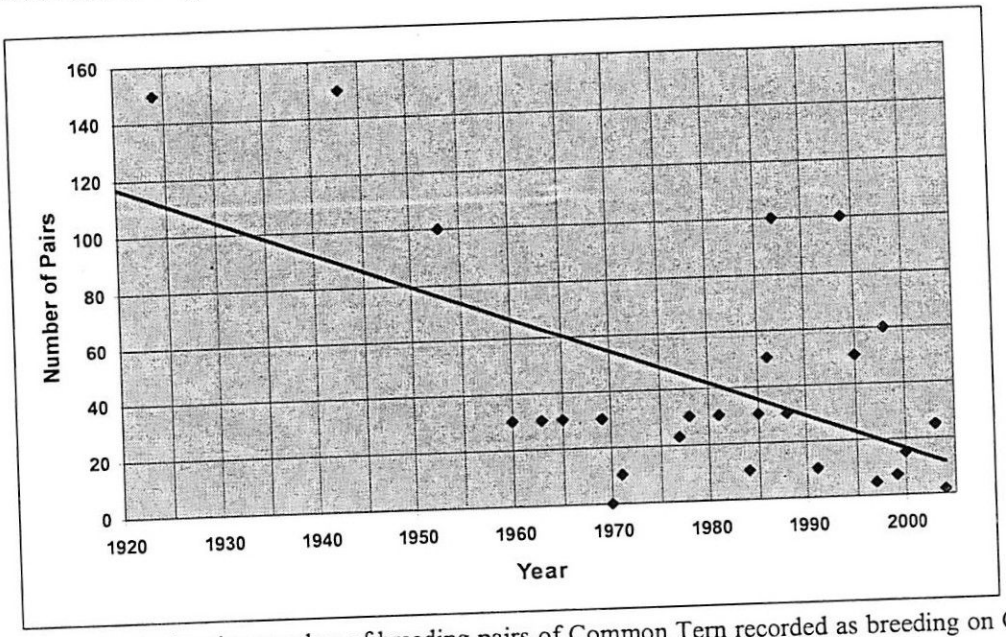

Figure 13: Graph showing number of breeding pairs of Common Tern recorded as breeding on Green Island, Samson from 1924 to 2004 (Figures taken from a variety of sources).

Three nests were on Green Island in 2004 (including one relay) as opposed to at least 35 nests in 2003. This site is prone to bad weather and flooding by high tides. Some areas of the island hold water in pools for a long time and terns that nest in these areas are particularly susceptible to over wash. In 2004 one nest was lost to the tide as it was constructed below the high-tide mark, the other two nest attempts fledged one chick each as they were better situated and constructed (***see Appendix I for photos of tern nests at this site***). In 2004 two pairs of Oystercatcher nested on the island and a single pair of Herring Gulls. The Herring Gull nest was situated within approximately ten feet of the nearest Common Tern nest and caused significant disruption until settled on the nest.

In his study Kress (1983) found that a pair of Common Terns would not nest within five metres of nesting Great Black-backed Gull, and outside the line of sight. Upon removal of the gull nest, the gulls abandoned the site and within two weeks, twenty pairs of Common Tern recolonised the area.

However, it was decided not to remove the gull nest on Green Island to limit the choice of nest sites available to terns once the birds had abandoned the Appletree Banks site. This also allowed the outcome of terns, gulls and oystercatchers nesting in close proximity to be studied. No tern eggs were lost to predation by gulls at this site, and at least two chicks were fledged from the three nesting attempts. The Herring Gull nest failed at the egg stage, and no Oystercatcher chicks fledged despite several eggs hatching. On the 13th July a predated Oystercatcher egg was discovered with the hole in the egg being consistent for the shape of an oystercatcher or possibly tern bill. ***(see figure 30)***

4.3 Peashopper

"Some" terns were reported as breeding on the Foreman's Island complex in 1945, the only other references are to a single pair in 1999 and seven pairs in 2003. At least six pairs used the site in 2004.

Five nests were found on the 29th May, with a further two discovered on the 1st July, one of which was thought to be a relay. In total 18 eggs were laid and of these a minimum of five chicks fledged, a productivity ratio of 0.71 chicks per pair. Productivity was 0.57 chicks per pair at the site in 2003.

Two pairs of Herring, one pair of Lesser black-backed, and one pair of Great Black-backed Gulls nested on the island in 2004. Their nests were removed on two occasions during the early season, and once terns had become well established they abandoned the site. A total of eight nests containing 16 eggs were removed from this site in 2004.

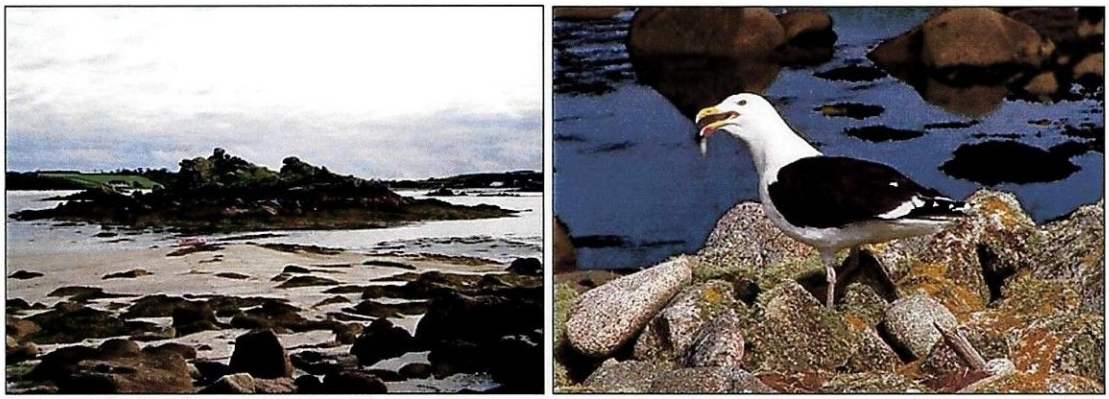

Figure 14: Peashopper (left) offers an ideal nesting habitat for small numbers of terns, and of the currently occupied sites is the most suitable for Roseate Tern. A single pair of Great Black-backed Gulls (right) were successfully discouraged from nesting at the site by continued nest destruction throughout the early part of the breeding season.

Peashopper offers some excellent nesting habitat for terns. Its elevation and sheltered location mean it does not suffer from tidal problems. There is a variety of vegetation, and a network of natural stone shelters and lookout points meaning avian predation at the site is likely to be minimal. On one side of the island is a thick patch of Sand Sedge (*Carex* arenaria) which is unsuitable for nesting terns. If this area was cleared/strimmed then the carrying capacity of the site would be increased.

Currently Peashopper is rat free, though the large numbers of rats on nearby Tean and Tresco could potentially cross to here on a low spring tide. It suffers from minimal human disturbance in the form of boats and canoes, which do not seem to disrupt tern breeding. However, guests from the Island Hotel were noted leaving canoes and walking round the island on one occasion in August after the terns had left. Had this practice occurred regularly during the summer then it is likely the terns would have abandoned the site. With limited vegetation management, awareness-raising at the Island Hotel, sign placement on the Old Grimsby quay, and continued destruction of gull nests, the site could be improved for breeding terns. These techniques could also be applied to similar neighbouring islands if and when the tern population increases to a level were more habitat is required.

4.4 White Island, St. Martin's

A single pair of Common Terns was reported breeding at this site in 1985 (ISBR, 1985). In 2004 two pairs laid five eggs between them on different parts of the island and fledged a minimum of three chicks.

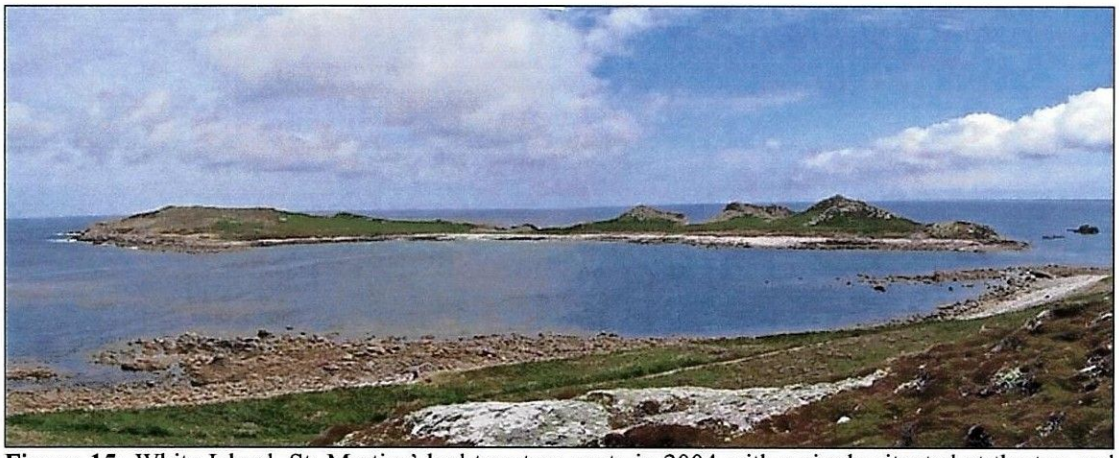

Figure 15: White Island, St. Martins' had two tern nests in 2004 with a single situated at the top and another at the base of the left hand hill.

Nesting was first suspected at this site on the 2nd June (Jackson, pers com). A visit on the 6th June eventually found a pair relentlessly mobbing a Great Black-backed Gull resting on offshore rocks. The pair spent just ten minutes out of the next hour incubating while the gull remained. Access to the site later in the day found a single 3-egg nest. On the visit of the 29th June two ten-day old chicks were observed being fed at a rate of two food items per hour. A 2-egg nest was discovered on the hill top by Viv Jackson in early June, and fledged a single chick.

Figure 16: The area of White Island used for one nest with St. Martin's in the background (left), and the 3-egg nest at this site built with substantial amounts of nest material, perhaps in response to the threat of flooding (right).

White Island has the potential to be an excellent tern breeding site as it generally sheltered in parts, does not suffer inundation from high tides, has some areas of suitable cover, and potentially offers a large area of tern breeding habitat. However, the island is also used by breeding gulls, though not in the numbers or density found on Samson, and is subject to human disturbance when the tide allows. Rats are also present though activity levels have not been fully assessed.

4.5 Merrick

Merrick means tern in old Cornish and this site has historically been favoured by small numbers of birds, presumably due to its isolated nature away from human disturbance. Historically, twenty pairs bred in 1953, noted as absent in 1955, four pairs in 1962, some in 1982 and 1991, thirty pairs in 1992, small numbers in 1997 and 1998, and thirteen pairs in 1999. In 2004 six pairs laid seventeen eggs, with five of the nests containing three eggs, but productivity was just 0.16 chicks per pair due to eggs being lost to heavy rain.

Common Terns were noted on Merrick Island in the Tresco Channel from the 18th May to the 12th July. Nesting was suspected on the 27th May when at least six pairs appeared to be incubating. Access to the site on the 10th June found six nests, all situated within rain gullies on the rock. After the heavy rain and strong winds between the 22nd and 24th June just a single pair was noted using the site. Access to the site again on the 1st July found all the nests and eggs absent, and just a single two-week old chick, the only chick thought to have fledged from this washedout site. Washouts are defined as colonies in which at least 1/3 of all nests were washed out (Burger and Gochfeld, 1991).

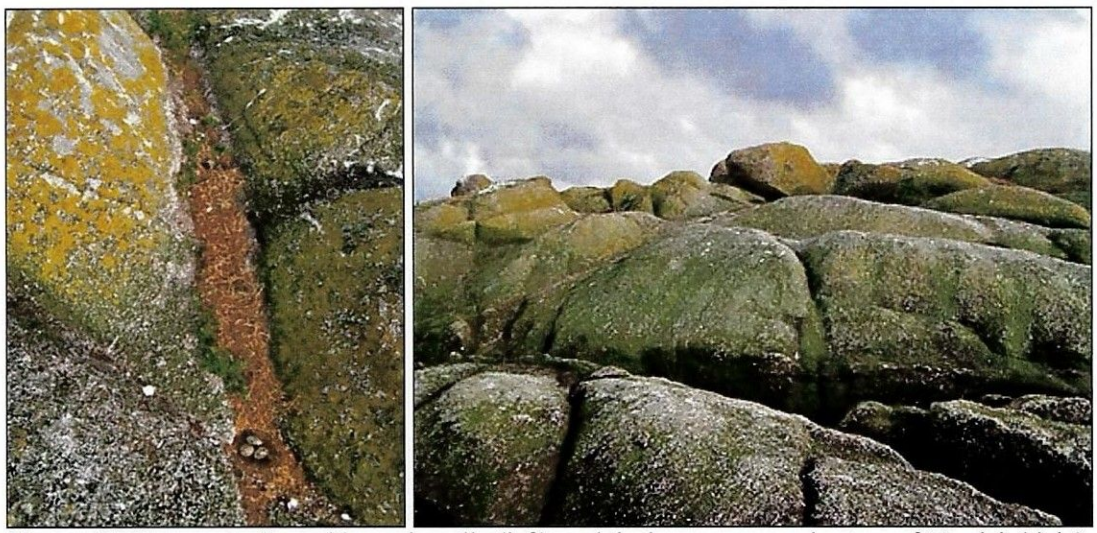

Figure 17: Tern nests situated in a rain gully (left), and the barren, exposed nature of Merrick (right).

The Merrick site is little more than a collection of rocks and is very exposed in nature. While it does not suffer from wash-over by strong seas and high-tides due to its elevation, it offers no vegetation or rock cover for chicks from the elements. Nests situated in rain gullies are always likely to be washed away after prolonged rainfall, and the chances of productivity reaching even 0.5 chicks per pair at this site is perhaps only a five or ten year event. For acceptable productivity to be reach a rain free period of about six weeks in June/July would be required to allow for successful incubation and fledging of young.

To remedy this situation it may be possible to attach free draining platforms with tern shelters to the rocks. However, due to the small numbers of birds that historically nest here, the difficulty of access, and the associated costs this course of action is of low priority. Encouraging birds to nest here may also lead to the dilution of the main colonies, as this site cannot provide nest habitat for large numbers of birds.

4.5 Appletree Banks, Tresco

Terns were recorded as breeding on and around Tresco in the twenty six years from 1945 to 2004 with Appletree Banks and Castle Down being favoured sites, the former holding a maximum of 150 pairs in 1973 (ISBR, 1973). In 2004 it had looked like the Appletree Banks site would be the largest in Scilly with ten pairs present on the 26th May with at least six of those apparently incubating. A further thirty pairs were courting on the beach nearby and in the Skirt/Green Island area. It was decided not to enter the colony to mark nests and count eggs at this time so that birds would remain undisturbed during this critical period of colony formation. Terns were still present next day with several being observed flying back and forth to the colony site with fish used for courtship.

The visit on the 29th May to count and mark nests found the colony site totally deserted, with not a tern in site during three hours of observations. There was no trace of any eggs, shell, feathers or nest scrapes within the colony. At some point during Friday 28th May the birds had abandoned the site. The reasons for this abandonment are unclear, though human interference seems likely, as no predator except man could be so ruthlessly clean in the predation of nests. I do not want to speculate as to who or why people might have disturbed the colony but helicopter disturbance, dog walkers, quad bikes, farm machinery and guided walks were all noted in the vicinity of the colony during observation in 2003/4. The resultant increase in the number of terns on North Hill on 30th May suggests the birds had relocated there from Appletree Banks.

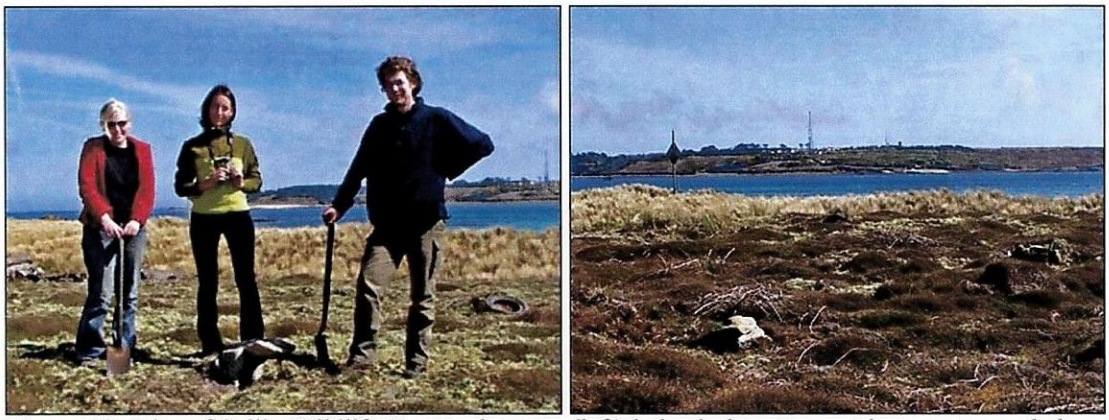

Figure 18: Isles of Scilly Wildlife Trust volunteers (left) helped place ten nest boxes, stones shelters, and tyres donated by the Tresco Estate on the Appletree Banks tern colony site (right).

In light of the disruption of the colony in 2004 perhaps terns should be discouraged from using the site in the future. In many ways the abandonment worked out well as the majority of terns ended up breeding together in a roped off area, amongst shelters, on an uninhabited island, well above the high tide mark, and productivity was higher as a result. While perhaps rather extreme, the deliberate disturbance of this site in future years could be beneficial to overall productivity. Such actions should be open to discussion and given careful consideration.

4.5.1 Other Tresco sites

Green Island, Tresco held two pairs in 2004. One three egg nest was predated a few days after the chicks had hatched. A two egg nest was abandoned at the same time. Human disturbance is a problem at this site at low tide. Castle Down was empty of terns this year after one pair had raised two young in 2003.

5.0 Other Tern Species in Scilly in 2004

5.1 Sandwich Tern

First sighting of the year came from Porth Mellon where three were seen on the 17th March. This was followed by a single in the Tresco Channel on 22nd March and two off Samson on the 28th March. By the 2nd April there were twenty five birds present in the Roads and main spring passage then followed.

For the second year running a lone pair of Sandwich Tern (*Sterna sandvicensis*) nested unsuccessfully in Scilly, this time on Peashopper Island. Access to the island on the 10th June to count Common Tern nests led to the discovery of a single Sandwich Tern egg which was cold to the touch. Presumably this was a breeding attempt by the pair that had been seen courting around Stoney Island, Samson on the 8th June. It is quite possible that this pair had another nest attempt at an unknown location (perhaps in the Eastern Isles/St. Martin's area?) as two birds were seen sat on Green Island, Tresco on the 8th July, and singles roosting around Samson on the 13th June and 13th July.

Figure 19: A 1-egg Sandwich Tern nest (above left) was discovered abandoned on Peashopper, a further breeding attempt was suspected but not discovered. Juvenile Sandwich Terns (above right) were seen in Scilly in good numbers from late July onwards, though none were suspected to have been reared locally.

Up to a maximum of ten Sandwich Terns were noted fishing around the Samson Flats between the 30th June and the 13th July, presumably failed breeders from elsewhere, although two young were seen with seven adults on Stoney Island, Samson on the 13th July. Autumn passage of migrants began from the 20th July when 20 were noted on Skirt Island, Tresco. Numbers built up thereafter with approximately one hundred birds present from the 11th August to at least the 8th September (Morris, pers com). Three juvenile Sandwich Terns were noted with metal rings on the right leg on Skirt Island, Tresco on the 25th July (Wheatley, pers com). Sandwich Terns greatly outnumbered Common Terns in Scillonian waters during autumn migration.

5.2 Arctic Tern

The first sighting of Arctic Terns in Scillonian waters in 2004 came from St. Martin's on 16th April where three were seen. Up to three Arctic Terns (*Sterna paradisaea*) were also thought to be present in Scilly tern colonies during the summer of 2004. Arctic Terns apparently bred in Scilly outnumbering Common Terns in 1880, but declined thereafter, though 40-60 pairs were reported breeding on Annet as recently as 1964, and a few pairs may have attempted breeding on Tresco in 1973, and 1977 (Robinson, 2004).

Figure 19: Between 1 and 3 Arctic Terns (above left and right) were present in the islands for much of the summer though no breeding was suspected. This bird attempted to form a hybrid pair with a Common Tern in the North Hill tern colony.

The first sighting in 2004 was on the 25th May over Appletree Banks, Tresco and was presumed to be the same bird present at this site in 2003. It, or another, then moved to North Hill when the Appletree Banks tern colony failed. However, an Arctic Tern was observed on the majority of visits to all Scilly tern colonies, with sightings from Samson, Tobaccoman's Ledge, Guther's and around Peashopper made within a week. The regularity of observations led me to believe that there may be more than one bird present, and indeed this appeared to be confirmed on the evening of the 15th June when two, possibly three, Arctic Terns were heard and seen on Samson. The last sighting of the resident bird(s) was on Green Island, Tresco on the 25th July.

During the majority of observations the Arctic Terns were carrying fish and attempting to court Common Terns, suggesting all birds in Scilly during 2004 may have been male. The North Hill bird unsuccessfully courted a Common Tern throughout the season. Whether the Arctic was courting the same Common Tern all summer or any single bird present in the colonies was not known, but in any case no breeding attempt was though to involve an Arctic Tern.

Hybrid pairs have been recorded for a number of tern species, especially the larger terns (Randler, 2002), while Harrison (1983) reported Common x Arctic and Common x Roseate Tern hybrids. A hybrid tern chick would likely cause great identification difficulties, and if the situation ever arose in Scilly that a hybrid pair successfully fledged young, the chicks (and preferably the adults) should be rung.

5.3 Roseate Tern

Single Roseate Tern's (*Sterna dougallii*) were reported on three dates, though none were seen by the Tern Warden, and again no breeding was suspected. The first reported sighting came from the Tresco channel on the 13th May, though the observer left no details and the bird was not re-found. The second report was made from Samson on the 24th June heading towards Green Island where it landed (Webb & Hudson, pers com). Frustratingly the observers did not stay to watch the bird or inform the tern warden and it was not seen again. What was thought to be a juvenile was seen feeding in a mixed flock of Common, Arctic, and Black Terns on a pelagic trip east of the islands on the 12th August (Flood, pers com), however it has been suggested that this bird may actually have been an unusually marked Arctic Tern.

Figure 20: Coquet Island, Northumberland held 73 pairs of breeding Roseate Terns (above) in 2004, the entire English population.

While the use of the CD lure device used by Channel Seabirds in 2000-2002 proved to be only moderately successful in attracting breeding terns (Robinson, 2002-04), it has proved successful elsewhere (Kress, 1983). The positioning of the system on Samson may also have been incorrect. Calls projected to the west would most likely not be heard by migrant terns (and therefore possible breeders) fishing/roosting in the favoured areas of Samson flats and the Tresco channel. It is my belief that the positioning of a large number of decoys within a colony, and the continued calls projected by the CD lure device may lead breeding terns to believe that the colony is actually larger (and therefore better protected) than it really is. This could lead to the colony being left under-guarded during the breeding season, and therefore more prone to predation.

Sandwich Terns were noted feeding and roosting on the Samson flats regularly over the season. However, on no occasion were birds noted coming to investigate the colony on North Hill. This is perhaps because their calls while fishing/roosting in the area were not answered due to the absence of breeders from North Hill. A lone Arctic tern was in the North Hill colony throughout the season and called regularly. On the 15th June three Arctic Terns were seen here, presumably attracted by the calls of the resident bird. This suggests that calls given from North Hill can and do attract terns of the same species to the area. The manual control of a CD-lure system during migration times, and when prospective breeders are present in the area may prove successful in luring a variety of tern species to the area. The positioning of small numbers of dummy terns of all tern species known to have bred on Scilly within the colony area could then help to encourage birds CD-lured to the area to nest. Calls used on play back should be carefully selected so that alarm calls are not included.

5.4 Migrant Terns

"Orange-billed" Tern

On the 1st September an Orange-billed Tern was seen flying overland from Gimble Porth towards New Grimsby, Tresco (Flood, pers com). It was thought to be a Lesser Crested Tern presumably from the tern colony at Banc d'Arguin, Gironde, France where Elegant, Royal, Lesser Crested, and an unidentified orange-billed tern were all seen over the summer of 2004 (Birding World 17: 278).

Little Tern

A Little Tern (*Sterna albifrons*) was observed fishing off the north shore of Samson on 22nd June, presumably blown in from a breeding colony in northwest France by the southerly storms at this time. Single Little Tern nests were reported in Scilly on Tean in 1908, and at Pelistry in 1919 (Penhallurick, 1969), though it seems unlikely it will return as a breeder in modern times due to the disturbed nature of suitable beach sites in Scilly.

Figure 20: A Little Tern (left) fishing off Samson in June was a rare sight in Scilly, while higher than usual numbers of Black Tern (right) were seen from pelagic trips around the islands in autumn.

Black Tern

The autumn passage of Black Terns was higher than usual with reasonable numbers with at least twenty being noted from pelagic trips around the islands between the 4th August and 10th September. The nearest breeding sites to Scilly are Brittany, France and in the Netherlands (Cramp et al., 1985).

5.5 Rare Species Action Plan

Hopefully the Roseate Tern will return as a breeding species to Scilly in the near future. However, if it does then a course of action needs to be in place in relation to people management. The tern project in Scilly has generated a good deal of local and regional interest, and if it proves successful then people are likely to want to come and see the Roseate Tern, if its presence is publicised. On Coquet Island, Northumberland the increased number of breeding Roseate Terns has drawn more visitors than previously experienced at this site (Morrison, pers com). On Coquet, Roseate Tern tourists do not disturb the birds, as nesters are situated on an island that has closed access, the colony is monitored by CCTV, and wardens are resident on the island over the summer. In Scilly the problems are rather different as there are so many different tern sites, and so many visitors to many of the islands, and more limited resources. With no resident warden on site at the tern colonies in Scilly management of visitors to colony sites could be a problem.

The presence of a rare vagrant tern species summering with Scilly terns should also be considered. In the 1990's Elsie the Lesser-crested Tern summered in a Sandwich Tern colony on the Farne Islands, Northumberland and became something of a celebrity in the birding world. Thousands of visitors went to see Elsie and generated considerable local revenue. The likelihood of keeping the presence of a major rarity secret in Scilly over the summer is highly improbable, and the impact substantial numbers of tourist on the breeding terns and wider environment should be considered.

Things that need to be discussed for a Rare Species Action Plan include:

- Should the presence of breeding Roseate Terns, or rare vagrant tern species be publicised?
- Should there be organised tours to see the birds? Who should lead them?
- Should visitors be charged for these tours? If so how much and what should the money go towards?
- Should there be 24-hour colony wardening in such an event?
- Who will carry out the wardening?
- How large an area should be closed access?

It is my own believe that the presence of breeding Roseate Terns should be publicised, but viewing of the nest site restricted. If a programme of daily wardening is embarked on then this is likely to impact considerably on the wider tern monitoring work with other colony sites requiring regular checks over the summer. A programme of local volunteer wardening (perhaps with members of the ISBG) would help alleviate this problem. The logistical requirements of wardening and visitor management are likely to vary between the locations of different sites.

6.0 Factors Influencing Breeding Success

6.1 Food Availability

Food availability has a huge influence on the breeding success at a colony and is probably one of the main factors that make tern colonies so erratic in their size and location from year to year (Hume, 1993).

In 2004 seabird colonies off the Yorkshire coast and the Shetland Islands are heading for their worst breeding season on record due to warming of the North Sea and the resultant movement of plankton and sandeel shoals. (Townsend & Sadler, 2004)

Methods used for monitoring food availability at tern colonies in Scilly in 2004 were the same as in 2003, with fish species, and size in relation to the length of the bill, being noted during timed half an hour observation periods.

Olsen and Larsson (1995) state that the bill length of the Common Tern subspecies *hirundo* is 32.1-40.3 mm in adults, with males averaging longer than females (36.8 compared to 35.7). For the purpose of this study the bill will be thought of as 36mm in length.

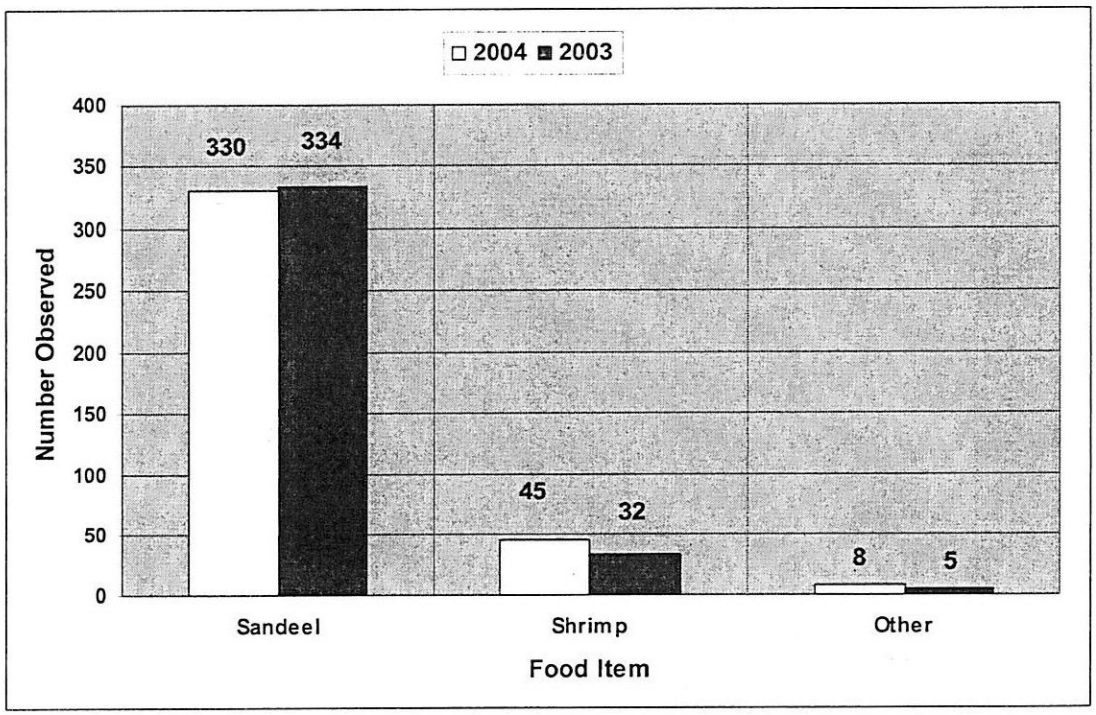

Figure 21: Bar Chart showing fish species observed at tern colonies in 2004

As in 2003, Sandeels were the preferred prey item (86%) for Common Tern's on Scilly in 2004. Shrimp were more numerous at the colonies than in 2003, and the high calorific content of this prey item (Nagy et al, 1999) perhaps helped fledge more chicks.

On the Ythan estuary, Scotland sandeels and herrings were the main prey at high tide, but at low tide shrimps and blennies became the most important element of the diet. On the Ribble estuary, however sandeels were the high-tide choice replaced at low tide by sprats (Hume, 1993)

Cuckoo Wrasse sprats were noted being taken to the North Hill colony on three occasions, coinciding with spring low tides. A non-breeding adult Common Tern on North Hill nearly choked on a small flat fish on 28th June, but eventually dropped the meal. Terns choking on their meals are not unheard of. Due to the sandeel shortage at Coquet Island in 2004 adult terns have been bringing large numbers of pipe fish up to 35cm long to chicks, these wrapped up in the throat and caused chicks to choke and die (Morrison, pers com).

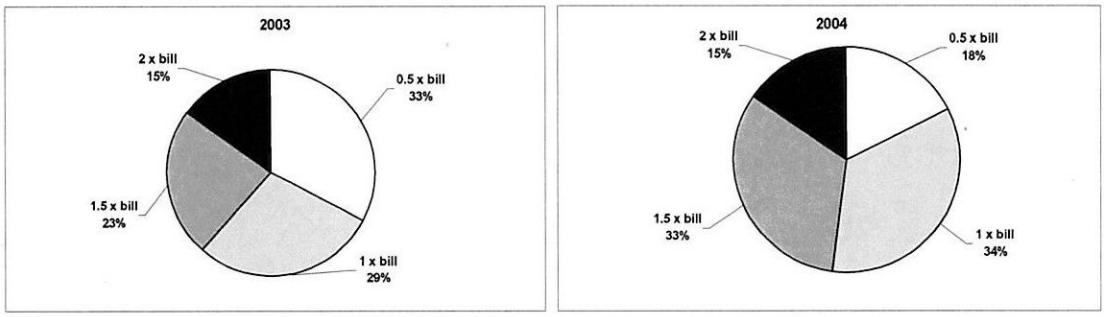

Figure 22: Pie charts showing size of fish observed at tern colonies in 2003 and 2004

Food items observed at tern colonies in 2004 averaged larger than in 2003 (mean 4.4 cm in 2004 and 3.9cm in 2003). Small food tended to be provisioned to chicks in their first few days of life, before being fed larger items thereafter.

On North Hill in 2004 food was provisioned at an average rate of 0.75 food items per pair/per hour (pp/ph) over the entire breeding season. This compares to 0.69 food items pp/ph in 2003. A pair on North Hill in 2004 brought food at a rate of five food items per hour once chicks were present. In 2003 food was provisioned at an average rate of 1 food item pp/ph over the entire breeding season.

Figure 23: Sandeel (left) made up 86% of observed food items at Scilly tern colonies in 2004, and shrimp (right) made up 12%, only being catchable around spring low tides.

Sandeels make up an important part of many seabirds diets (Cramp et al, 1985). In Scilly they are the main food source for Puffin, Razorbill, Guillemot, Shag, Kittiwake, and tern species (pers obs). No study has ever been carried out on their abundance and distribution in Scillonian water as there is no commercial fishing of the species. Perhaps in light of the food shortage that has been experienced in other parts of the country a study on Sandeel populations in Scilly is more urgent than ever. Such a study is likely to be a major undertaking and the methods and implementation employed requires further research and discussion.

6.2 Predators

Predation of tern eggs and chicks in Scilly (by a number of species) has been suggested as having a major impact on tern productivity in the past. The species implicated include; Brown Rat - *Rattus norvegicus* (ISBR, 1992), Domestic Cat - *Felis domesticus* (ISBR, 1992), Carrion Crow - *Corvus corone* (Robinson, 2000), gulls - *Larus sp.* (ISBR, 1992), and Oystercatcher - *Haematopus ostralegus* (ISBR, 1995; and Wescott pers com).

Species Name	Samson	Tresco	Annet	P'hopper	Source	Year
Grey Heron	yes	yes	yes	yes	*Wendeln & Becker*	1999
Little Egret	yes	yes	no	yes	*Nisbet & Welton*	1984
Jackdaw	no	yes	no	yes	*Newton & Crowe*	2000
Carrion Crow	yes	yes	yes	yes	*Robinson*	2002
Raven	no	yes	no	yes	*D'Eon*	1998
Turnstone	yes	yes	yes	yes	*Parken*	2000
Oystercatcher	yes	yes	yes	yes	*ISBR*	1995
Canada Geese	no	yes	no	no	*Cuthbert*	1980
Peregrine	no	yes	no	yes	*Newton & Crowe*	2000
Brown Rat	yes	yes	?	no	*ISBR*	1992
Domestic Cat	no	yes	no	no	*ISBR*	1992

Figure 24: Table showing presence of potential tern predators (of adults, chicks, and/or eggs) at different breeding sites in Scilly, and a source that has suggested predation by those species has affected common tern productivity in the UK and/or abroad. Sightings of species at the different sites are based on my own observations in 2003/4.

To study which of the above predators are seen as major threats to terns in Scilly, observations were carried out throughout the summer where mobbing of these species (and others) by terns around tern colonies was noted.

To determine which species were responsible for the predation of tern eggs the following criteria were used:

- Herring Gulls ate tern eggs whole, carrying them off or simply eating them at the nest (Hume, 1993). Eggs that "disappeared" from nests were attributed to gull predation.
- Corvids do not eat eggs whole, and broken shell remains are found (D'Eon, 1998).
- Rats leave distinctive gnaw marks on eggs with much of the shell left intact (pers obs)
- Waders leave distinctive puncture holes in eggs and remains are generally rather messy (pers obs)

6.2.1 Predator Mobbing Observations

In 2004 the methods used for monitoring predator presence around tern colonies was the same as in 2003. These observations were made during timed half an hour observation periods. In addition the age of species mobbed was also noted in 2004 to determine if particular age groups of gulls represent a greater threat to breeding terns.

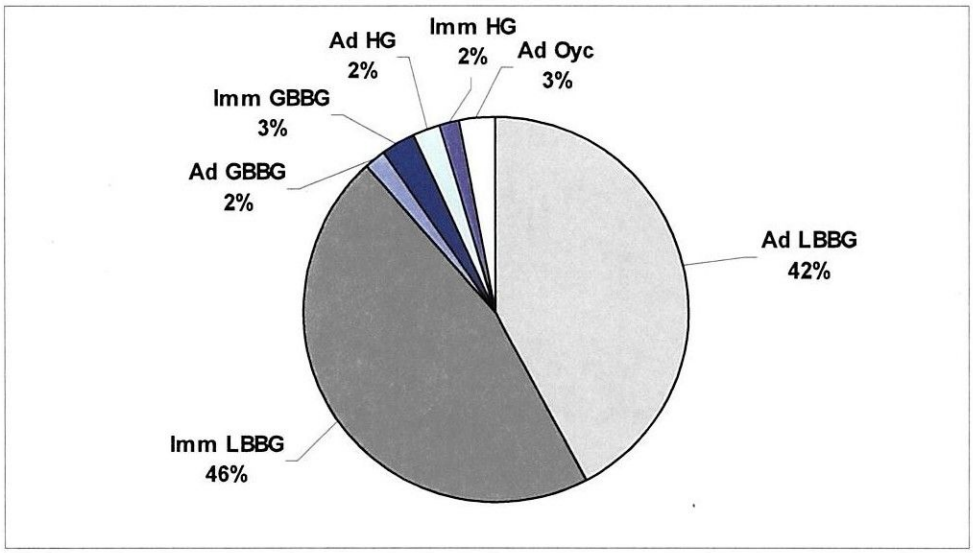

Figure 25: Pie chart showing age of species recorded being mobbed by Common Terns during timed observations in 2004.
*Age of species for gulls as follows; Ad = Adult (i.e. 3 years old or over), Imm = Immature (i.e. under 3 years old)
** Species noted as follows; LBBG = Lesser Black-backed Gull, GBBG = Greater Black-backed Gull, HG = Herring Gull, Oyc = Oystercatcher.

Lesser Black-backed Gulls (Lessers from now on) made up the majority of mobbing observations in 2004. This is unsurprising as the majority of observations were made from Samson where there are several large gull colonies, numbering probably into the thousands, located close to the tern colony. Interestingly, immature Lessers (i.e. birds less than three years of age) were noted being mobbed on more occasions than adults, despite them being generally outnumbered by adults at gull colony sites.

In 2003 adult Lessers with nests situated close to the tern colony were subjected to relentless mobbings (often over 50 in a five minute period) by the nearest pair of incubating terns, particularly at times of nest change over for the gulls. These repeated mobbings by terns take up a substantial amount of energy, and also mean that terns spend less time foraging. The removal of these gull nests helped to reduce the number of mobbings undertaken by terns in 2004.

Herring and Great Black-backed Gulls were only rarely observed around the North Hill colony in 2004. Herring Gulls prefer to nest on the boulder beaches surrounding Samson, rather than in amongst the bracken which is the favoured site for Lessers. Great Black-backed Gulls are generally more solitary breeders, though occasionally in larger colonies, and situate themselves at an average of 20 metres from other nesting gull species (Cramp et al, 1983).

Mobbings aimed at Oystercatchers all related to a single pair which chose to nest on the east facing sloped of North Hill within fifteen metres of the edge of the tern colony. They occasionally wandered into the tern colony and were then mobbed. This activity was more frequent once terns had chicks.

6.2.2 Gull Summary

Gulls compete for nest sites, and begin breeding earlier, than terns and can exclude them from previously favoured areas (e.g. Kress, 1983; Owen et al., 2001; Thomas, 1972). Gulls have also been observed predating tern eggs and chicks at a number of colonies (e.g. Yorio and Quintana, 1997; Spretke, 1998; Casey et al, 1995). Predation is generally carried out by specialised individuals of gulls (Gonzalez Solis et al, 1997; Burger and Gochfeld, 1991; Morrison, pers com).

During observations in 2004 the age of gull species being mobbed by terns was noted to determine if particular age groups were more likely to become specialised tern predators. In 2003 immature Lesser and Great Black-backed Gulls were regularly noted around tern colonies, particularly on Annet where they were thought to be responsible for much of the egg predation experienced at this site (RTSRPR, 2003).

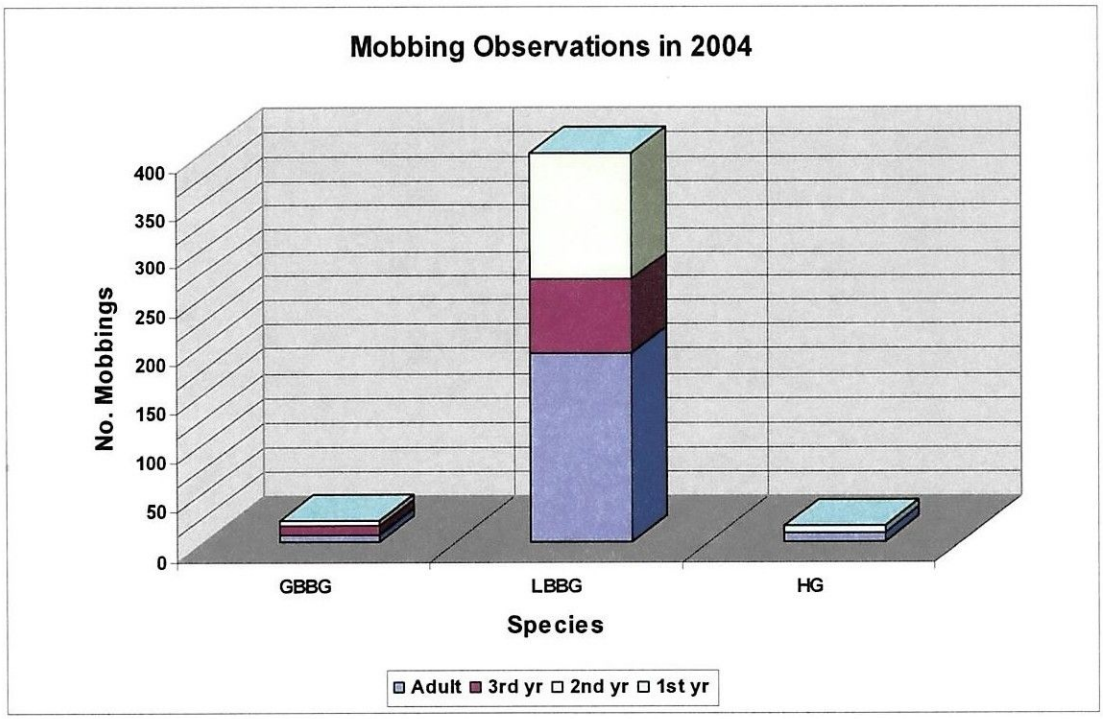

Figure 26: Bar chart showing age of gulls species observed being mobbed at Common Tern colonies in Scilly in 2004

** Species noted as follows; LBBG = Lesser Black-backed Gull, GBBG = Greater Black-backed Gull, HG = Herring Gull,

Lessers normally breed first at four (occasionally three to six) years of age (Cramp et al, 1983), which means any bird younger than that in or around a gull colony is a non-breeder. As a result these birds do a lot of hanging around, and exploring of future feeding/nesting opportunities around colonies. It is my belief that it is at this age that gulls become tern specialists, and perhaps retain the trait into later life. Certainly these young birds seemed to be mobbed particularly vigorously, and often by more terns than would mob an adult Lesser. Adult Lessers flying over the colony would generally be chased off by one or two adult terns, whereas immatures would often be pursued by up to ten birds who would make more than one attack and follow them a greater distance from the tern colony.

6.2.3 Gull Nest Destruction

In response to the high level of tern egg predation by gulls in 2003, and the disruptive nature of gulls nesting close to tern colonies, it was agreed to destroy gull nests situated in the vicinity of colonies in 2004.

Ickes et al (1998) examined five nest destruction techniques against Herring and Ring-billed Gulls nesting on building roofs in the Great Lakes region of the USA. Nest interference caused desertion of established colonies in only two of eight cases. However, the number of nests was reduced considerably after one year of control.

Kress (1997) highlighted the relationship between gull removal and the re-establishment of a ternery in Maine. The removal of gulls also had a beneficial effect on puffin numbers in the same area. However, it was noted that management would have to continue if these populations were to be maintained in a healthy state in the long term. In this study gull control was targeted at islands, or parts of islands, that were specifically earmarked for tern nesting and gull populations in the region remained high.

Gull nest removal procedure followed that practiced on Coquet Island, Northumberland as laid out by Barrett (2003). Any gull nest and/or egg found within 50 feet of the tern colony on North Hill was destroyed. This was done once a week with the first control on the 12th May and continued until the 10th July when the majority of tern chicks had fledged. Gull nests and/or eggs found on Peashopper were destroyed once every two weeks. Gull nests and/or eggs on the Southern end of Annet were initially destroyed, but once it became apparent that the majority of terns were nesting on North Hill and the Annet site was unoccupied this practice was stopped.

	Nest Destruction			
	North Hill	Peashopper	Annet	Totals
LBBG	24	2	0	26
GBBG	0	2	2	4
HG	0	4	3	7
No. Nests	24	8	5	37
No. Eggs	26	16	9	51

Figure 27: Table showing species, location, and number of nests destroyed during gull control programme in 2004.
** Species noted as follows; LBBG = Lesser Black-backed Gull, GBBG = Greater Black-backed Gull, HG = Herring Gull,

Lesser Black-backed Gulls again nested within 20 metres of the Common Tern colony on North Hill, and while they were subjected to less regular mobbings than in 2003, terns still spent a significant amount of time mobbing incubating gulls. The area that the gulls nest in is small, and contained at most 12 pairs at the start of the season, nests were removed at two week intervals, but even so three or four pairs continued to relay as the season progressed. These gulls are probably new breeders, as they are nesting at the colony edge.

A problem associated with the nest destruction on North Hill was encountered in that extended time had to be spent in and around the tern colony while destroying the nests. This meant terns were disturbed for longer, and nests left unattended for longer as well. Egg destruction of Black-headed Gulls nesting within a Sandwich Tern colony on the Farne Islands was stopped because the activity disturbed the terns (Howkey, 1991).

On Peashopper after two rounds of nest destruction, the four pairs of gulls present abandoned the site. The second round of nest destruction coincided with the time that terns had become well established at the site and were then able to successfully ward of predators. This follows with Morris et al. (1992) suggestion that if gulls can be kept at bay (by disturbance, nest destruction or other means) until the terns have established territories; the terns can successfully defend these from gulls.

On Annet just a single round of nest destruction was carried out on the southern end of the island. Once it became clear that terns were not using the site the practice was stopped. All the pairs of gulls whose nests had been destroyed recolonised in the same area within two weeks.

The apparent expansion of gull colonies in Scilly over the last 20 years can be put down to a number of factors such as increased availability of human refuse, number of fishing boats. However the reduction of gull numbers in Scilly as a whole seems improbable and is outside the scope of this study. But Pons (1992) found that there seems little doubt that if the availability of artificial foods is reduced this will cause a decrease in gull populations and there are examples where breeding success of gulls has fallen after the availability of food from refuse has been reduced.

Figure 28: Few juvenile Lesser Black-backed Gulls (above) fledged from the vicinity of the North Hill tern colony thanks to nest destruction during the season.

An area close to the tern colony was also used as a roosting site by adult Lessers. Lesser roosting "clubs" form near gull colonies and comprise immatures, non-breeding adults, and failed and off-duty breeders (Cramp et al, 1983). At Skokholm, gull feeding and nest-relief peaked in early morning and late evening, so loafing periods were highest in the middle of the day (Cramp et al, 1983). A study by Burness and Morris (1991) on Lake Eerie found that Herring Gull foraging activity was at its highest between 6 and 9 am, and 5 and 9 pm.

Lesser Black-backed Gulls could further be discouraged from nesting, roosting and loafing around the tern colony on North Hill by using a combination of the following techniques. The choice of future gull management techniques requires further discussion:

A) English Nature's paper entitled "Gull Culling for Nature Conservation Purposes" (Owen et al., 2001) found that excluding gulls from nesting areas by putting physical barriers such as monofilament lines or wires above the area to be protected has been successful in many studies and such lines do not deter terns from using the same area. Excluding gulls by physical barriers is attractive because it does not involve obvious harm to the gulls or their breeding. However, the erection and maintenance of the barriers is very labour intensive and can only be used over small areas.

Blokpoel and Tessier (1983) successfully excluded ring-billed gulls from 20x20m plots within a dense breeding colony by stretching monofilament lines across the plots at 60cm intervals. These were very effective in stopping gulls from nesting. Control areas had on average 224 nests, whereas taped areas had three nests and the majority of these were deserted during laying or incubation. Morris et al (1992) and Maxson et al. (1996) found monofilament and coloured nylon lines to be similarly successful in excluding nesting gulls and that the gulls did not habituate to the lines. Blokpoel et al (1997) used monofilament lines with other techniques to exclude gulls from a tern nesting area. The technique was successful and tern numbers increased from none to 149 pairs over five years of gull control. However, when the lines were removed the gulls soon returned and numbers of terns fell in the following year to only three nests while gull numbers rose to 250 nests. They concluded that effective tern management requires on-going control of gulls.

B) Pimlott (1952) found that laying dead gulls on their backs with wings outstretched led to the abandonment of approximately 1,000 Herring Gulls from a previously favoured feeding ground. Although Kress (1983) found that dead gulls in colony areas did not discourage other gulls from nesting in the area.

Placement of dead gulls may encourage scavenging predators (e.g. rats) to eat the carcasses, and also has the problems associated with decay, smell, and disease. Realistic wooden models of dead gulls would remove these problems and would require no maintenance once in place. There has been no study as to the effect on terns of the placement of dead gulls close to tern colonies and it is possible, though unlikely, that their presence could lead to abandonment by terns.

C) The continued removal of gull nests and eggs from the area throughout the breeding season to mop up any persistent nesters.

6.2.4 Other Predators on Samson

Raptors

Raptors represent a significant threat to adult and juvenile terns. Newton and Crowe (2000) noted Sparrowhawk *(Accipiter nisus)*, Kestrel *(Falco tinnunculus)*, and Peregrine *(Falco peregrinus)* at Irish Sea tern colonies. These species generally cause prolonged dreads (i.e. large numbers of terns are defensively airborne at the same time), and on several occasions were seen taking juveniles terns, and the occasional adult. At Lady's Island Lake in 1999 a Peregrine was seen to take at least six adult Roseate Terns during the season.

In Scilly, an Osprey flying around the South Hill Samson and then across the Samson Flats on the 25th May 2004 was mobbed by over 60 terns as well as thousands of gulls, the majority of which followed it all the way to St. Mary's.

Figure 29: A Lanner type falcon (above left) has been living on Scilly since April 2004 and has been seen over three tern colonies. It was though responsible for killing five adult Common Terns (above right) in the North Hill colony.

A Lanner type falcon was seen over Samson on three occasions during the summer, as well as over Annet/Western Rocks (present for at least two weeks), Round Island, St. Mary's and Tresco. Presumably it is an escaped falconer's bird as it appears to be a hybrid of some sort, although it has no jesses or rings. On each occasion it was seen on Samson the tern colony would defensively take to the air (even when the falcon was some considerable distance away) and mob the bird profusely far out to sea. On the 4th June 80 terns mobbed it for well over two miles. During these events the tern colony was left totally unguarded for up to 15 minutes. The Lanner type was thought responsible for the death of five adult Common Terns, whose remains were found in and around the North Hill colony, showing signs of being eaten by a falcon (see photo above right). At no time during the summer were the local Peregrines noted on Samson, though two of the dead adults were found after the three Peregrine chicks raised in 2004 had left their nest. Seal Researcher Stephen Westcott reported finding at least twenty dead shags on Rosevear in August which appeared to have been eaten by a falcon.

A Hobby which flew from the Norrad Rocks over the tern colony and towards St. Mary's on the 25th July was mobbed by around eighty terns.

Corvids

Corvids have been suggested as having a major influence on tern breeding success in Scilly (Robinson, 2002). Newton and Crowe (2000) found Jackdaws *(Corvus monedula)* and Hooded Crows *(Corvus corone)* occasionally predated tern eggs at Irish Sea tern colonies, although the relative impact of these species on overall productivity was minimal. Where as D'Eon (1998) studying terns on North Brother, Nova Scotia found crows (possibly just one bird) to be responsible for the predation of hundreds of tern egg.

At no time during 2004 were Carrion Crows noted at the North Hill site. However, birds (up to four) were seen searching for food along the tide lines in West and East Porth on several occasions during the summer. On the 20th July there were two adults and three youngsters feeding in West Porth. Carrion Crows were reported around the Appletree Banks tern colony prior to its abandonment in 2004 (Dorien-Smith, pers com).

Rats

On 22nd May two empty poison bags, which appeared to have been gnawed by rats, were found on paths around North Hill, one being some considerable distance from the nearest bait station, presumably moved there by gulls.

A check of bait stations on the 12th June showed some further take but no other rat signs (Mawer, pers com). A re-bait of stations on the 5th July showed no further take.

A number of gull eggs that were removed during the first round of gull nest destruction on the 12th May were placed under rocks around the North Hill site to check for predator presence. All remained intact by late July.

An RSPB mammal trapping study from 27th August to 2nd September showed there to be some rat presence around South Hill, though offshore Puffin, Green and Stoney Islands were reported as rat free (St. Pierre, pers com).

Rats unfortunately seem to have found their way onto Annet during 2004, with two sightings made on different dates from the island (Westcott, pers com).

Other Birds

A Grey Heron on the 4th June, fishing in West Porth and then flying along the west shore of North Hill, appeared to land in the Kittiwake colony causing over 100 gulls to take to the air, which stimulated the terns to mob the gulls. This disturbance lasted over ½ hour until the heron moved away.

Newton and Crowe (2000) suspected Oystercatchers *(Haematopus ostralegus)* may have taken some tern eggs at Irish Sea tern colonies, although predation by this species was never actually witnessed. Oystercatchers are thought to have predated tern eggs on Scilly in the past (ISBR, 1995; Wescott, pers. com.; Wagstaff, pers com), though again direct predation has never been witnessed. At least five pairs of Oystercatchers were known to have nested around North Hill in 2004. One pair nested on the east side of North Hill within 20ft of a Common Tern nest. This pair was noted being mobbed by breeding terns on a number of occasions, but managed to raise one young until about three weeks old. On the 25th July it was found dead in an area where tern chicks were being fed, possibly having been killed by adult terns as it appeared uneaten. Two pairs nesting on Green Island may have predated a common tern nest located nearby, and approximately 100 birds roosted at high tide on Stoney Island.

Figure 30: Oystercatchers (above left) have been implicated for predation of tern eggs in Scilly in the past. An oystercatcher nest on Green Island (above right) appeared to have been predated by another pair nesting nearby.

Turnstones *(Arenaria interpres)* have been suggested as egg predators at several tern colonies (Hume, 1993; Newton and Crowe, 2000; Parken, 2000). At least 15 Turnstones were present on the Samson Flats during the summer and these would join the Oystercatchers roosting on Stoney Island at high tide. No eggs were thought to have been lost to this species in 2004.

An Arctic Skua was seen chasing the roosting Common Terns on Green and Stoney Island, Samson on the 9th August (R. Mawer, pers com). While Skua do not kill adult terns, their kleptoparasitism tendencies could cause decreased tern productivity due to a reduction of food provision to chicks if present over a long time period. However, Skuas are rarely observed in Scilly in the summer months (ISBNHR, 2002) and their impact on tern breeding is likely to be negligible.

Starlings (30th May), Rock Pipits (5th June), and a Racing Pigeon (15th June) that landed within the tern colony were chased off by incubating birds nearby.

6.3 Human Disturbance

Human disturbance can take the form of injury to eggs, chicks, or adults, or the indirect form of harassing birds, interruption of incubation or parental care, causing exposure of chicks and/or eggs to the elements and/or predators (Burger and Gochfeld, 1991).

Burger and Gochfeld (1991) found that human disturbance is a cost for most birds except those that nest in inaccessible locations such as remote islands. In recent years the majority of tern colonies in Scilly have been situated on isolated, exposed, rocky, off-shore islands. It seems the terns have adopted to avoid human pressures by nesting in these areas, and in doing so then face added threats from tides, bad weather and the large gull colonies on Annet.

Disturbance has been suggested as a having a detrimental effect on common tern productivity in Scilly in the past (ISBR, 1970). Indeed it seems likely that human disturbance is often responsible for the failure and movement of tern colonies, particularly early in the season when birds are wary.

All types of human presence (be it people, dogs, planes, helicopters and/or boats) in or around tern colonies was taken to be human disturbance. On each occasion the number of people involved, the number of terns that responded, and the length of time terns were away from nests was noted. In addition the number of people visiting Samson was recorded on each trip by the tern warden. Disturbance by the tern warden was also monitored through the season; time spent in colonies on each visit was recorded. Colony visits were kept to a minimum, and when visiting colonies observations were made from a distance that allowed birds to return to nests. Tern warden disturbance was further reduced via the use of a camouflaged poncho kindly provided by Bryan Thomas of the ISBG. In total, over the course of the season, all tern colonies were entered to check nests/eggs on twenty occasions, eight of these being on North Hill, Samson. An average visit time of thirteen minutes was spent in tern colonies in 2004, more than the average time of twelve minutes in 2003, but still well below the forty minute maximum suggested by Radcliffe and Del Nevo (1995)

There have been measures in place in Scilly in the past to limit human disturbance to breeding terns. In 1973 the Appletree Banks area of Tresco was fenced and both Common and Roseate Terns bred successfully, producing plenty of young within the protected area (ISBR, 1973). That year it was clear that measures taken by the local conservation committee had proved effective in reducing human disturbance, though how long the area remained fenced, and why it was stopped remains unclear. In more recent times an area on the top of North Hill Samson has been fenced to give the tern colony greater protection from human disturbance.

In 2004 the usual area on North Hill was roped off again using bamboo poles and a double run of baler twine. Two signs were placed at the boundary of the fence and paths running from the north and south ends of North Hill. The restricted area was observed by all visitors to the island during observations in the early part of the breeding season. However, once the birds from Tresco had moved sites and settled in there were several pairs that nested on the east slope of North Hill, some thirty metres from the path along the boundary fence. These birds would react to human presence on the footpath by taking to the air and calling loudly, and had the effect of causing the rest of the colony on the west slope to leave their nests to come and investigate.

The entire colony would then follow the intruder along the length of the path until well away from the fenced area. With an average of twenty visitors to Samson each day over the course of the summer (more on sunny days), and the majority of them walking the North Hill path, this represented significant disturbance to the colony.

Kress (2000) recommended a buffer/fenced zone of at least fifty yards from the nearest tern nest and that the area should be expanded further if this is inadequate to prevent the birds from flushing. On the 22nd June it was decided after consultation with Dave Mawer, IOSWT Senior Conservation Warden, to extent the roped off area to prevent people walking the path around the initial roped off area. This was done using short runs of post and baler twine to create fences and the positioning of three new signs at the fence boundary explaining why the area had been closed. Within an hour of the new fences going up two violations were noted, one by three tourists, and another by a local couple and their dog (which was not on a lead). Upon questioning them as to why they had entered the area, the tourists stated that the signage was confusing (particularly the "earth works repairs" signs which are dotted all over North Hill), while the local couple refused to believe the fencing was necessary or that their actions were having a detrimental effect. On both occasions approximately 100 terns followed their progress from the air. After the new fencing was erected concerns were raised at tourist information, and by several local tour leaders, that it should be made clear before visitors got to Samson that the area was closed. In response to this laminated signs stating the duration of the closure and the reasons why were placed on notice boards in Tourist Information, at the bird board by the Pilots Gig, and by the Isles of Scilly Wildlife Trust office and visitors centre. Despite this there were at least a further five violations of the fenced area noted over the remainder of the season. The majority of visitors to the area would approach the fence, read the sign and retrace their steps.

Several incidents of human disturbance in 2004 are worthy of mention in detail:

- 3rd June - Alan Titchmarsh and a film crew visited Samson with part of the filming done from a helicopter. However, despite previous liaison with the IOSWT and advice to avoid over-flying the area, the helicopter was observed circling North Hill several times and disrupting the tern colony.
- 16th June - A fighter jet flew low over North Hill and caused the entire colony to take to the air.
- 18th July - A dog was accidentally left on Samson by a private yacht for over an hour, and during this time unsupervised chased newly fledged tern chicks around the beach.
- 11th August - Two quad bikes were observed travelling at high speeds up and down the southern shores of Tresco.

Human disturbance has been found to have a detrimental impact on tern productivity at a number of tern colonies worldwide. For example, Burger (1984) studying Least Terns in the USA found that human disturbance accounted for over half of the reproductive failures in a colony. The low turnover rate and high loss to human activity suggested that reproductive success could be improved by increased protection. Indeed successful people management measures have been put in place at several sites and tern productivity has increased as a result.

A study of Damara Terns (*Sterna balaenarum)* in Namibia found that fencing off colony areas, and the provision of information boards, increased nesting density slightly, hatching success increased from 56% to 80%, and disturbance incidence reduced from 870 a month to zero (Braby et al, 2001). Burger and Gochfeld (1991) studying Common Terns in the USA found that human disturbance was a daily occurrence at several colonies. The colonies were fenced, but this was disregarded on occasions, and broken down at first. After several years the fence coupled with researcher presence effectively reduced human transgressions. Kress (2000) recommended fencing staging areas where birds congregate prior to migration and 'nursery areas' where recent fledglings congregate while awaiting meals. He also found that in Massachusetts tern sites where there were Tern Wardens present at the nesting sites predation appeared to be significantly lower.

These examples show that through a combination of fencing, interpretation, warden presence, and perseverance human disturbance at tern colonies can be successfully reduced to a level where it is no longer having a detrimental impact on tern breeding success. A programme of prolonged people management around tern colonies in Scilly needs to be discussed and agreed for future years, which should include the amount of area to be closed and the time-scale of closures. Awareness-raising and interpretation can go a long way to changing peoples attitudes and the following suggestions would undoubtedly help to reduce human disturbance, make people more aware of their actions, the Roseate Tern programme and, the work of the partner organisations involved:

- Leaflets and announcements to be made on tripper boats prior to their arrival on Samson. Announcements should highlight which areas of Samson are closed, why and for how long.

- Future broadcasts on Radio Scilly and through other local media would help convey the message to visitors to Samson who visit on private transports.

- The presence of a manned interpretation tent on Samson during the tern breeding season would help provide stricter policing of the site, as well as give visitors the opportunity to ask questions about the project and gain a better understanding of the reasons for closure. The placement of a spy in the nest camera that could be viewed on Samson would act as a fantastic educational and awareness-raising aid, as well as giving the partner organisations a showpiece event in Scilly through which to provide information about their other work. There is also then the potential for web-based interpretation and school involvement.

- Implement an enforceable ban on dogs on Samson and at other seabird breeding areas

- A new sign to be placed on Samson landing beach to replace the existing sign which is outdated, inaccurate and does not convey a clear enough message. Any new sign should be carefully positioned and should include a map of the island highlighting paths, important bird breeding areas (of all species, not just terns), botanical interests, archaeological sites, and areas closed to the public.

- Closure of North Hill during the tern breeding season, and sections of the Samson flats once chicks have fledged and are moving to offshore roost sites.

7.0 Awareness Raising Campaign

During 2003 a limited awareness raising campaign was run. This took the form of leaflets explaining what the project was trying to achieve, how to identify different species of tern, and where to report sightings of tern species. This proved successful in that over 500 leaflets were collected over the summer, with approximately 50 returns, and a number of sightings entered on the tern sightings board.

In 2004 the awareness raising campaign was extended to try to reach more local people, as well as raise interest in the work of the IOSWT with tourists. Again leaflets were printed, and again 500 were taken over the summer. However, there were many fewer returns this year for some reason, and fewer people entered details of their sightings.

A press release was written and agreed by all the partners and was released to local, regional and national press on the 30th June. This contained quotes from representatives of the different partner organisations. Response and interest in the release was good, with the following pieces arising:

Radio:

- Pirate FM - An interview recorded on the 1st July was broadcast during the news bulletins on the weekend of the 3rd and 4th July.
- Radio Cornwall - Live interview on 1st July, with further items relating to the project on the hourly news throughout the day.
- Radio Scilly - An interview with IOSWT Membership Development Officer Peter Laverock was broadcast on the 23rd and 30th August as part of the Isles of Scilly Wildlife Trust hour.
- Radio Scilly - An interview with Kerry Jones on breakfast news on the 31st August to say the fence on Samson was coming down and provide a summary of the 2004 tern breeding season.

Newspapers:

- Western Morning News
- Cornwall Today
- West Britain
- Wildlife & Countryside Magazine
- Isles of Scilly Wildlife Trust Newsletter
- Isles of Scilly Bird Report 2003

Talks:

- A tour group of twelve people met on Appletree Banks, Tresco were given an impromptu talk about the project.
- Regular discussions about the project were had with some members of the St. Mary's Boatman's Association.
- A talk was given at the Bird Log on October 8th in conjunction with Paul Morrison, RSPB warden for Coquet Island.

8.0 Conclusions

In 2003 the reasons that Common Tern productivity reached just 0.43 chicks per pair was due to predation of eggs and chicks from gulls, and the loss of chicks to bad weather. In 2004 it was hoped to lessen the impact of these problems via the provision of tern shelters for chicks, and the removal of gull nests from within the vicinity of tern colonies. This proved successful in reducing the amount of predation from 27% of eggs in 2003 to just 4% of eggs in 2004, and productivity reached 0.58 chicks per pair in 2004. However, bad weather was again a major factor in reduced tern productivity, due to the storms of the 22nd and 23rd of June where SSW winds reached gale force eight at times. The timing of this was unfortunate as the tern chicks were too young to move to cover and a third of those that had hatched on North Hill were thought to have been lost in these storms. This event would probably have been avoided had it not been for the apparent deliberate disturbance of the tern colony on Appletree Banks Tresco. This caused the timing of egg laying (and therefore hatching) to be put back a week as the breeders moved to Samson and re-established territories. Had the chicks been a week older when the storms hit a large percentage would have found cover in tern shelters and the overall losses would have been far less significant.

In other ways the shifting of colony site to Samson worked out well, as the majority of birds nested in a protected area, on an uninhabited island, well above the high tide mark, and in the vicinity of specially made tern shelters. However, due to the increased number of birds present on Samson in 2004 the effects of human disturbance were more acute. Nesting terns were disturbed by human presence on North Hill with great regularity as the majority of the average twenty visitors a day to the island climbed North Hill for the views. On each occasion the terns would take to the air and mob the intruder until they had moved on from the area. This resulted in a significant amount of time being spent away from the nest due to human disturbance. An extension of the fenced area went only some way towards reducing this problem, and was disregarded on several occasions mostly due by local people. Clearly the message of tern protection on Samson has not reached all those living on Scilly, and a new strategy may be required if this site is to prove viable as a productive tern site. If such a strategy does not work then perhaps alternative sites should be looked for, though these are likely to require substantial amounts habitat management to make them suitable for nesting terns.

The lack of confirmed Roseate Tern sightings in 2004 is perhaps cause for concern, though it is my belief that non-breeding birds must be present in the spring and even summer that go un-noticed. The difficulty of observing migrant, roosting and non-breeding terns that spent a good deal of time on rocks far offshore is the reason for this. The monitoring of these birds is not likely to improve unless there is a greater flexibility in transport availability.

Considering the local losses due to bad weather and tides, and the terrible productivity experienced at other UK tern colonies, the RTSRP in Scilly in 2004 has certainly started to make a difference to tern conservation within the islands. There is now a clearer understanding of the factors that influence Scilly terns breeding success, and while those factors have begun to be addressed in 2004 the work needs to continue in future years if the overall population decline is to be stopped and reversed.

8.1 Recommendations for 2005

Nest Boxes/Shelters

- A further 20 Roseate Boxes to be on North Hill
- 30 A frame chick shelters to be placed near nests once laying has begun
- The provision of nesting material on North Hill

Habitat Management

- An extended area of 20m x 10m to be covered with black plastic on Annet
- Placement of sand in cleared areas around North Hill nest boxes
- Enhancement of rocky offshore sites with rocks, shelters, and platforms.
- Provision of some nest material on North Hill

Gull Deterrents

- Continued gull nest removal on Samson, Annet, and Peashopper
- Green nylon string across gull nesting area on Samson
- Continue predator observations
- Survey of gulls nesting on and around North Hill

Food Availability

- Continue timed ½ hr food observations
- Survey of Sandeel population in prime fishing grounds

Transport

- Ask Duchy of Cornwall if the Bittern can be used for tern warden transport
- Research other possible partners/methods of transport to allow more regular access to some of the inaccessible sites.

Human Disturbance

- Discuss and agree a programme for future people management at all sites

Nest Monitoring

- Continue egg/nest counts at least once a week at 3 main sites
- Carryout egg/nest counts at other sites at 2 week intervals

Action Plan

- Determine action plan for what to do if and when a Roseate Tern does nest, or if another rare species spends the summer.

Awareness Raising Campaign

- Continue leaflet production
- New sign to be placed on Samson landing beach and old earthwork repairs signs to be removed.
- Organised talks to be held on St. Mary's, perhaps in conjunction with the Seal Researcher Stephen Westcott
- Provision of leaflets to visitors to Samson by St Mary's Boatman Association
- Research and discuss the possibility of a manned interpretation centre on Samson.

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APPENDIX I

Photos showing composition of Common Tern nest materials at different sites in Scilly in 2004. All nests apart from those on North Hill, Samson used reasonable amounts of nest material. Nest construction is a critical factor affecting reproductive success (Burger and Gochfeld, 1991).

3-egg nest made with a few shells on Green Island (above left) that was lost to tides,
3-egg nest made with large amount of seaweed on Green Island (above right)

3-egg nest made with storm debris on Merrick (above left),
3-egg nest unlined in heather cup on North Hill, Samson (above right)

3-egg nest made with large dead grasses on White Island, St. Martin's (above left),
3-egg nest made with small amount of grass on Peashopper (above right)

APPENDIX II

Nest boxes have been used successfully at several sites in the UK and abroad to increase chick survival rates, and to provide suitable nest sites for Roseate Tern where none exist.

Photograph showing Roseate Tern nest box successfully used on Coquet Island, Northumberland.

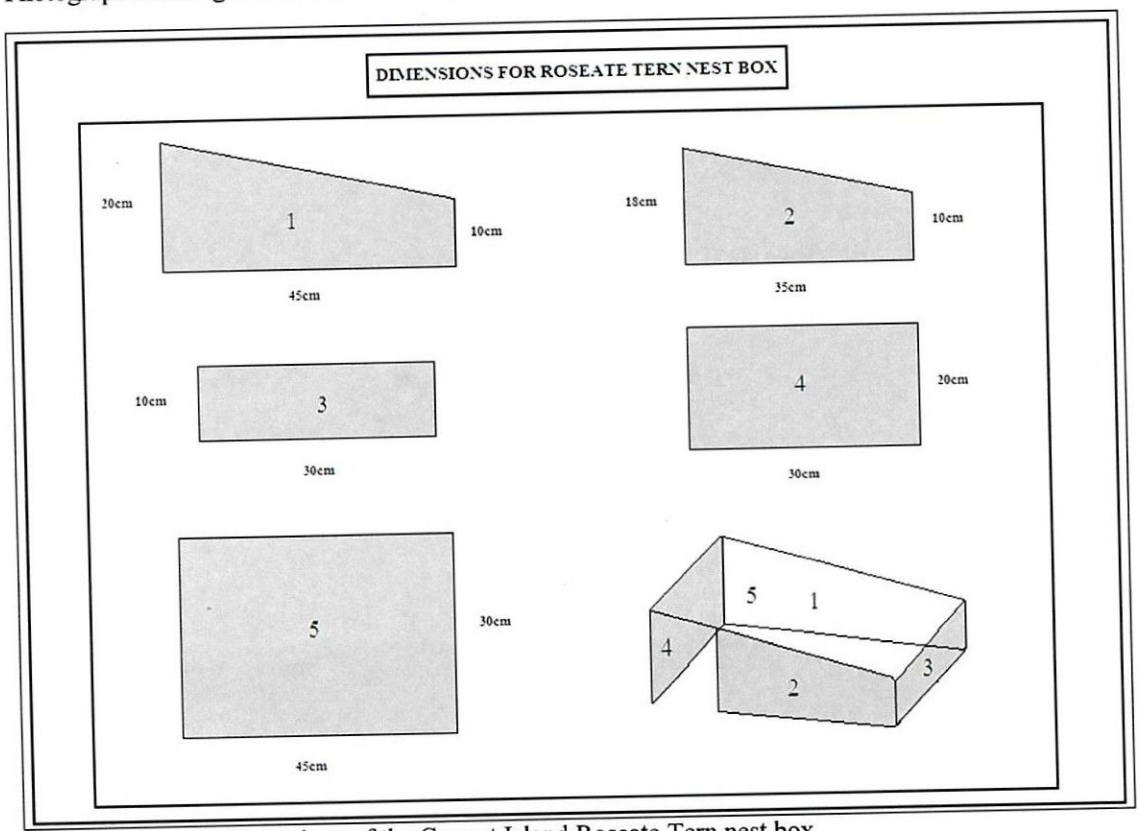
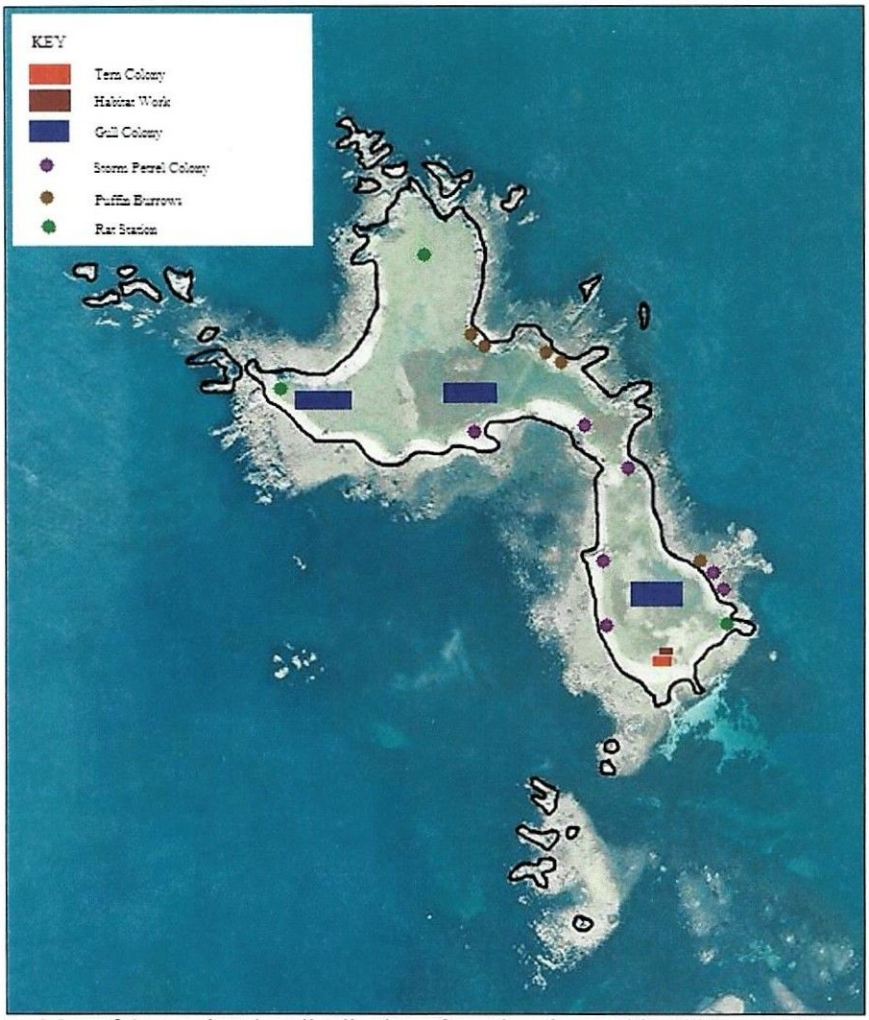
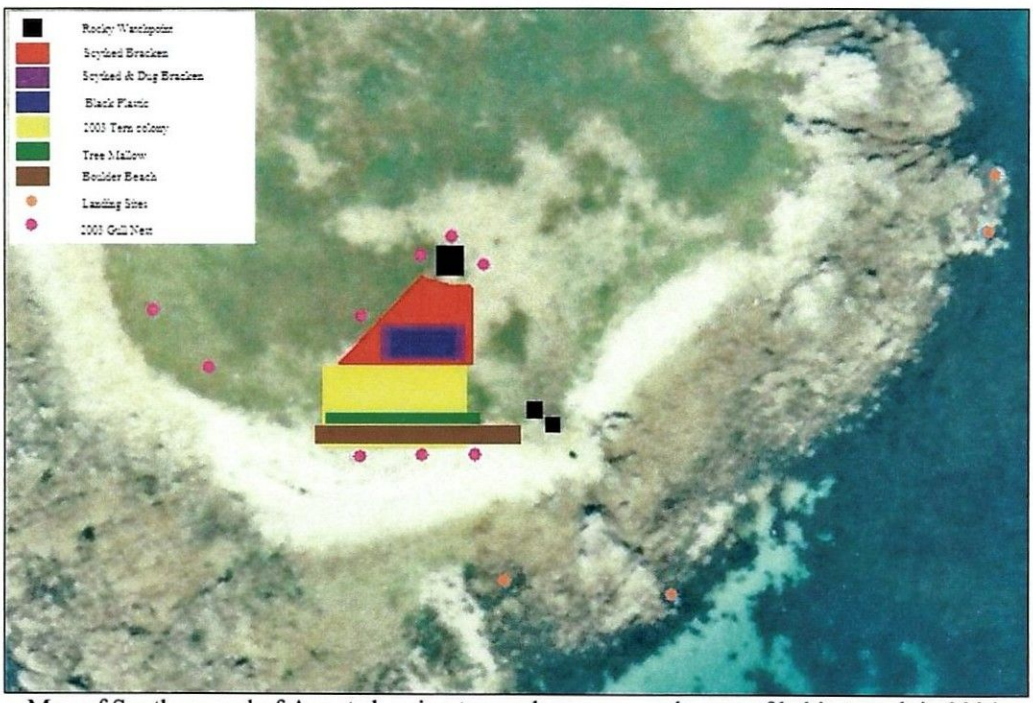


Diagram showing dimensions of the Coquet Island Roseate Tern nest box.

APPENDIX III



Map of Annet showing distribution of species observed in 2003 and 2004.



Map of Southern end of Annet showing tern colony area, and areas of habitat work in 2004.