

DISTRIBUTION OF EUROPEAN STORM PETREL
HYDROBATES PELAGICUS IN THE ISLES OF SCILLY
WITH PROBABLE ABUNDANCE



PETER ROBINSON

AUGUST 1999

**This report was prepared for English Nature Headquarters
As an element of Contract No P44/01/167
(Tern and Petrel Survey – Scilly – Summer 1999)**

Peter Robinson
Riviera House, Parade, St Mary's, Isles of Scilly TR21 0LP



Contents

Executive Summary	1
Preface – Seabirds and Scilly	1
Summary	2
Purpose of Survey	4
Study Methods	4
Storm Petrel – National and International Status	5
Historical Occurrence of Petrels	6
1999 Survey Findings	7
Seabird 2000 Findings	9
Conclusions	10
Discussion	10
Site Accounts in respect of Table III	16
Melledgan	16
Gorregan	16
Rosevear	16
Scilly Rock	17
Men-a-Vaur	17
Round Island	17
Annet	18
Site Accounts in respect of Table IV	18
St Martin's Daymark	18
Menawethan	18
Site Accounts in respect of Table V	19
Kitten Rock Gugh	19
Bryher Gweal Hill	19
St Mary's Giant's Castle	20
Site Accounts in respect of Table VI	20
Mincarlo	21
Illiswilgig	21
Samson White Island	21
Guther's Island	21
The Arthers	21
Ragged Island	22
Little Ganinick	22
St Agnes Burnt Island	22
Tresco North End	22
Bryher Shipman Head	23
Acknowledgements	24
References	24
Appendix I – Numbers and Distribution of Breeding Seabirds Recorded in the Isles of Scilly during 1999	

DISTRIBUTION OF EUROPEAN STORM PETREL *HYDROBATES PELAGICUS* IN THE ISLES OF SCILLY, WITH PROBABLE ABUNDANCE

EXECUTIVE SUMMARY

The European Storm Petrel is Europe's smallest breeding seabird and according to most recent estimate the world population is in the range 135,000 - 380,000 pairs, 85,000 pairs of which are in the UK. But despite the Isles of Scilly being its only known English breeding site no past attempt has been made to estimate distribution or abundance within these islands. In 1999 such a survey calculated that between 9,811 and 17,390 pairs of Storm Petrels may be present, representing 11.5% to 20.4% of the UK total. The survey also demonstrated the widespread presence of predatory rats and feral cats in Scilly's seabird colonies, both of which probably limit colonisation of additional sites by Storm Petrels and other seabirds. The survey coincided with the national 'Seabird 2000' count and a separate survey of breeding terns, which jointly recorded an additional 7,704 pairs of eleven species at 50 sites, excluding about 5-700 pairs of Manx Shearwaters, which were not surveyed. Thus the total number of seabirds breeding within the Isles of Scilly is currently in the order of 35,030 - 50,188 individuals. To which must be added a probably 1,000 - 1,400 Manx Shearwaters. After Storm Petrel the next most abundant breeding seabird species is Lesser Black-backed Gull, with 3,500 pairs. The Storm Petrel and tern surveys were commissioned by English Nature in order to determine a proposed boundary for the Isles of Scilly Special Protection Area.

PREFACE - SEABIRDS AND SCILLY

The Isles of Scilly are the sole European example of a Lusitanian semi-oceanic archipelago (Biodiversity: The UK Steering Group Report 1995). According to Tasker (1991) the seabirds of the islands "are of national and international importance. Not least because their numbers have been surveyed comprehensively on a number of occasions. In addition to some of their numbers being of importance, the Scilly Isles in many cases represents the most important part of the populations of some of these species at the south-westerly edge of their ranges. The diversity of species is very high, matched elsewhere in Britain by larger island groups or sites, such as St Kilda. Some seabirds are particularly attractive to the public and are thus of economic importance in attracting many people to the islands".

For all of these reasons, Tasker continues, "it is important to conserve and if possible enhance the populations of seabirds breeding in the Scilly Isles. Seabirds can also act as an indicator of the general condition of the marine environment, and a long-term decline, or series of years with poor breeding success can indicate more widespread problems offshore. It is thus important to monitor their breeding performance and population size."

Consideration should perhaps also be given to any likely effects of global warming upon seabird populations within the islands. Especially because they are uniquely situated within Britain for colonisation by more southerly breeding species expanding their range northwards.

The Isles of Scilly are positioned off the most south-westerly point of the British mainland, 28 miles (45 km) from Cornwall, at approximately 49° 56N - 06° 21W. The archipelago comprises five inhabited islands, the largest (St Mary's) about two miles (3.2 km) wide, plus some 200 lesser islands and rocks, about 50 of which are known to hold breeding seabirds, involving 13-15 species. These seabird islands can be separated into three discreet groups,

known locally as the Eastern, Northern and Western Isles. From east to west the archipelago spans about 10 miles (16 km), being slightly less distance north to south. The climate is influenced by the Gulf Stream, which has a marked effect on botanical makeup.

A feature of the islands is the expanse of shallow waters lying within the protection of the central and eastern sectors, overlaying a bottom of fine shell-sand. This shallow-water zone is mainly centred upon the inhabited island of Tresco. Away from this shallow area the seabed is mainly rock (granite) with deep water close inshore. Wide lunar tidal variations are an additional feature which, combined with the geography of the islands, results in the daily occurrence of strong inshore currents.

The islands contain species unique in Britain, e.g. Lesser White-toothed Shrew and Dwarf Pansy, and mammalian predators are limited to Brown Rat and domestic and feral Cats, plus the recently introduced Hedgehog. Some seabird islands appear naturally rat-free.

SUMMARY

Regardless of the fact that Scilly is the only known Storm Petrel breeding site in England, no previous full survey of distribution or numbers has been attempted. A survey of Storm Petrel breeding presence plus an estimation of likely abundance was carried out at all apparently suitable sites in the Isles of Scilly during July and August 1999, using diurnal tape playback or overnight visits (see Table XV for scientific names of species). The survey was carried under contract to English Nature Headquarters

A total of twenty-two sites were checked and birds were proved present 'below ground' during daylight at seven of these, whilst at two additional sites substantial numbers of birds trapped at night suggest likely breeding presence. Recent cat-predated petrel remains at three further sites show birds go to ground there, though proof of breeding was lacking. Diurnal taped playback (Ratcliffe *et al* 1997) at another ten sites produced no

evidence of petrel presence, though several sites appeared eminently suitable by visual comparison with known sites. Some of these same sites also have a recent history of petrel presence. Several other apparently suitable sites could not be visited owing to adverse weather or sea conditions and some boulder areas were considered unsafe to work when wet.

The survey was timed to coincide with the later stages of incubation and the first week after hatching and calling small young were an almost as frequent indication of petrel presence as responding adults. A sample of six chicks examined from within Annet boulder beaches was estimated to have hatched between mid July and early August, from eggs laid mid June (Robinson & Haw in prep).

There was an apparent negative correlation between the presence of Brown Rats and/or cats and the absence of breeding Storm Petrels. Although the 96 acre (38.8 ha) unoccupied island of Samson was previously cleared successfully of rats in just two winters, subsequent work on a selection of smaller islands is proving considerable more protracted and less successful.



Storm Petrel chick – Annet 1999

Storm Petrels were reportedly common in the islands even before the mid 19th century and the recently published estimate of 1,000 pairs for the whole of Scilly (Pritchard *et al* 1992) appears to lack supporting information and was perhaps always substantially inaccurate (Allen 1974; Robinson & Haw in prep). Although, at many breeding sites, nests are traditionally in stone walls, in Scilly nest are routinely positioned within boulder or storm beaches, or similar rocky areas, with fewer located elsewhere, e.g. rock crevices beneath dwarf vegetation, or in rabbit and other burrows. Most known colonies are situated within the Western and Northern Isles, with a heavy rat or cat presence perhaps limiting colonisation in the Eastern Isles, and inhabited islands; though petrels may also dislike areas of dense vegetation on the former. However all sites with a proven presence are situated on the outer extremities of the archipelago and adjacent to deep water.

From 1991 to 1998 Storm Petrel ringing by the Scillonian Seabird Group was limited to seven sites, three of which involved single-session visits each contributing less than 1% of the eight-year total. Two of the four multi-session sites (Annet and Round Island) were shown to hold large breeding concentrations prior to the present survey. Whereas the remaining two (Gugh and Burnt Island St Agnes) produced totals of 530 and 190 birds respectively but lack evidence of breeding, even though birds are known to go to ground of their own volition.

A total of 4,605 Storm Petrels were ringed in the period 1991-98; 2,868 of which were on Annet and 910 on Round Island, with pre-survey population estimates for these two sites in the region of 1,600 and 625 pairs respectively. A further 296 birds were ringed at five sites during the survey.

Doubts arose during the survey over the reliability of taped diurnal playback as a means of proving or disproving Storm Petrel presence, despite its recent use in assessing population levels on Annet (Robinson & Haw in prep). A situation not helped by substantial difficulties attaching to any research involving this species. Recent survey work on Annet revealed significant differences in response to diurnal playback at two boulder beach sites, perhaps attributable to the depth birds penetrate within one of these. Which in turn may effect the ability of birds and survey workers to hear each other.

A feature of past Scillonian seabird surveys has been a reported lack of Storm Petrel site fidelity (philopatry) between survey years. Such reports conflict with findings from elsewhere and with what we know of seabird breeding biology generally. And are perhaps accounted for by failures in survey methods. A notable feature of recent ringing work in Scilly has been the numbers of occasions when few, or even no, birds appeared present at colonies known to hold hundreds of pairs. With no clear correlation to a particular weather type.

However, given our limited knowledge of this and related petrel species, it may be that complex and as yet unknown influences on daily petrel behaviour, perhaps at sea, may one day explain apparent wide disparities in survey findings. For despite recent advances much remains still to be learned and perhaps the most reliable means of assessing numbers of Storm Petrels at individual sites currently lies in long term capture-recapture studies, e.g. Amengual *et al* (1999).

Nevertheless, likely minimum and maximum estimates for those islands found or thought capable of holding breeding birds were calculated in the range 9,811 to 17,390 pairs (Table I). Making it the most abundant breeding seabird in Scilly, with the next most abundant being Lesser Black-backed Gull, with 3,500 pairs. On this basis Scilly assumes importance in Britain

and Europe as a major breeding site for this species, holding between 11.5% and 20.1% of the UK population - which JNCC has currently determined at 85,000 pairs.

TABLE I
Estimated Likely Numbers of Breeding Storm Petrel (Pairs) - Scilly 1999

Island or Site	Estimated Pairs - Min	Estimated Pairs - Max	'Usable' Size (acres)
Annet	1,700	1,700	8.83
Round Island	625	625	3.33
Melledgan	481	1,011	2.5
Gorregan	963	2,023	5
Rosevear	481	1,011	2.5
Scilly Rock	578	1,214	3
Men-a-Vaur	578	1,214	3
Mincarlo	578	1,214	3
Illiswilgig	578	1,214	3
Castle Bryher	578	1,214	3
Rosevean	578	1,214	3
Great Crebewthan	578	1,214	3
Gugh	300	300	1.5
Burnt Island (St Agnes)	300	300	?
Daymark (St Martin's)	578	1,214	3
Menewethan	337	708	3.5
Totals	9,811 (11.5% of UK)	17,390 (20.1% of UK)	51.16

With experience, in areas of boulder beach, it is sometimes possible to identify active Storm Petrel breeding sites by a combination of physical features. Including the presence of the lichen *Ramalina saliquosa* (a probably indicator of long-term physical stability), plus tiny fragments of moulted white body down (presumably from brood patch development, and which becomes caught in the *saliquosa*), plus the classic musty 'petrel' smell (Robinson & Haw in prep). However several previously unknown sites located during the survey suggest overemphasis may perhaps have been given to Storm Petrel use of boulder beaches by survey workers in Scilly in the past. With birds clearly demonstrating an attraction to (but not necessarily breeding in) a variety of substantial rocky outcrops, some of which are quite well vegetated. Some of these last sites are adjacent to areas much frequented by humans.

Trampling of nest sites by herbivores is viewed as a possible threat to breeding Storm Petrels (Batten *et al* 1990). As the Isles of Scilly Environmental Trust's existing 'Isles of Scilly Environmental Management Plan' calls for controlled grazing of some sites, as part of the overall management objective, this policy may perhaps need reviewing.

PURPOSE OF SURVEY

The survey aimed at establishing presence or absence of Storm Petrels at all selected sites throughout the Western, Northern and Eastern Isles and the five inhabited islands. In addition to which effort was made to prove breeding presence and, where possible, estimate likely numbers of pairs involved.

STUDY METHODS

Reliance was placed on either overnight visits or diurnal taped playback. Subject to favourable conditions birds were trapped during night visits and uniquely marked with metal leg rings. During each ringing session a single 12m long, standard mesh, 3m high mist net was used, combined with an 8 watts portable tape player. Breeding presence was proved either by examination of nests with egg or young, or by listening for small young (which can be quite vocal) calling below ground. During daytime, presence of adults below ground was proved

either by listening for responses to taped calls, failing which 'cold' searching of suitable areas was resorted to, though some sites did not lend themselves to this last method.

No attempt was made to accurately measure areas of likely Storm Petrel breeding habitat on individual islands, but this was crudely assessed as a percentage of the total. In an attempt to establishing breeding phenology for the survey year, a small sample of Storm Petrels chicks were examined at boulder beach nests on Annet and biometric data taken (Gilbert & Hemsley 1996; Ratcliffe *et al* (1997).

Whilst in an effort to meaningfully interpret numbers of birds heard or trapped, an attempt was made to compare these data with those from sites of known size - mainly Annet and Round Island. Plus additional resort to the literature and discussion with other workers.

STORM PETREL - NATIONAL AND INTERNATIONAL STATUS

The European Storm Petrel is an abundant oceanic species breeding along the eastern seaboard of the north Atlantic and wintering in the southern Atlantic. But with small numbers wintering in the Mediterranean (Minguez 1995 - in Amengual *et al* 1999; Cramp 1977-1994). According to Lloyd *et al* (1991) the world population estimate for Storm Petrel is in the range 135,000 - 380,000 pairs. With 20,000 - 150,000 thought present in Britain and a further 50,000 - 100,000 in Ireland, plus 1,000 in northern France. Though more recently the Government's Joint Nature Conservation Committee (JNCC) determined, pending results from a national survey, to adopt the midway point of 85,000 breeding pairs as the present estimated UK breeding population (P Clement pers com). No other country is thought to hold more breeding pairs than Britain.

Storm Petrel is Europe's smallest breeding seabird and a combination of strictly pelagic diurnal behaviour and subterranean nocturnal breeding biology help explain these wide variations in population estimates, which in any event may be considerable underestimates (Amengual *et al* 1999).

Storm Petrels breed in boulder beaches, stone walls, rabbit or other burrows (frequently sharing with other occupants), or in any other suitable hole or crevice. Females lay a single egg and both adults share incubation, which takes 38-50 (mean 40.5) days, whilst young fledge in a further 56-73 (mean 62.8) days (Cramp *et al* 1977-1994). Some regional variation in lay-date occurs, with most eggs in Scilly laid around mid June (Robinson & Haw in prep). Consequently young are present in Scilly within the nest chamber well into September and perhaps into October.

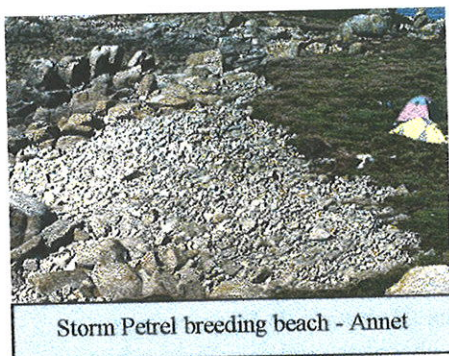
In Britain Storm Petrels are legally protected (as are the majority of wild bird species) under the Wildlife & Countryside Act 1981, which implements the European Council Directive 79/409/EEC on the Conservation of Wild Birds - otherwise known (and usually referred to) as the Birds Directive. Under the Directive, Member States of the European Union are required to take special measures to protect migratory, rare and vulnerable species of birds. Storm Petrel is included on Annex 1 of the Birds Directive, which includes some of the most vulnerable or sensitive breeding or wintering species. In Scilly most of the uninhabited islands have been designated as Sites of Special Scientific Interest (SSSIs) though not necessarily for their importance to breeding Storm Petrels. The present survey was commissioned by English nature in order to determine a proposed boundary for the Isles of Scilly Special Protection Area. This may also have the effect of extending some existing SSSIs for their seabird interest.

Under provisions of the 1979 Convention on the Conservation of European Wildlife and Natural Habitats (The 'Berne Convention') the Government is required to give special attention to the protection of areas of importance for migratory species specified in Appendix II and III. Compliance with provisions of the Bern Convention are largely undertaken through site protection measures identified under the Birds Directive as Special Protection Areas.

Storm Petrel appears on the list of Red Data Birds in Britain (Batten *et al* 1990) and threats to its future survival are assessed as predation from mammals, e.g. Cat and rats, or from large gulls and skuas, plus, possibly, marine pollution. Recommended conservation measures include designating all sites with over 200 pairs as SSSI's, or as Special Protection Areas and control of rats and Cats is considered essential. In some situations trampling by herbivores, e.g. cattle or sheep, may be a problem, but this requires further study. Batten *et al* (1990) express concerns at the possibility of population declines occurring even before an adequate population monitoring programme can be introduced.

HISTORICAL OCCURRENCE OF PETRELS

Penhallurick (1969) quotes others, suggesting Storm Petrels may have been "fairly common" even prior to 1863, "tolerably common" a decade later but in "greatly diminished numbers" early in the 20th century. But unfortunately these accounts are not further qualified. The same author gives a first date of 1903 for known breeding on Annet, but suggests this may previously have been overlooked, quoting "thousands" there by 1915, and further suggesting 2-3,000 pairs by the 1960s. Sites and previous visit dates quoted by various authors, e.g. Penhallurick 1969, Cramp *et al* 1974, Allen 1974, Harvey 1983, Smith & Birkin 1987, Robinson 1992, 93, 94, 95, 96, & 98, are shown in Table II.



Storm Petrel breeding beach - Annet

The only recent indications of Scillonian breeding abundance are as follows. Operation Seafarer (Cramp *et al* 1974) suggested numbers in the range of 2-3,000 pairs for Annet and 1-9 pairs only for Gorregan. Whereas Allen (1974) estimated 1,600 pairs on Annet, which he thought might be a minimal figure. More recently, Durham (pers com 1992 - using Scillonian Seabird Group re-trap ringing data) calculated pair totals of 625 for Round Island and 1,500 for Annet, St Agnes and Gugh combined. Whilst Robinson & Haw (in prep) calculated 1,640 pairs for Annet in 1997.

Various sites have been re-visited by different survey workers since 1970 and birds recorded as present, as was the case with some of these same sites during the 1999 survey. However reports by some previous survey workers, e.g. Allen (1974), of sites being deserted between survey years is difficult to either explain or accept, and may be more the product of failures of survey techniques, e.g. timing, than real. For example, recent overnight trapping at several sites has demonstrated the ability of known breeding sites to appear deserted on random nights, and for no obvious cause.

Some authors, e.g. Allen (1974) and Robinson & Haw (in prep), commented on the likelihood of Storm Petrels penetrating to two or more metres within boulder beaches, which on Scilly can be substantial and comprise both long-term, physically stable structures, and less stable 'storm' beaches. Indeed this particular feature was thought to account for a 50% discrepancy

in response rates during a diurnal tape playback study at two beaches on Annet in 1997 and 1998 (Robinson & Haw in prep).

TABLE II
Scillonian Sites with Previously Recorded Storm Petrel Presence
(includes birds present/trapped at site during darkness, plus present survey)

Western Isles						
Annet	1903	1967	1974	1983	1987	1992-99
Melledgan	1961	1999				
Gorregan	1948	1964	1967	1983	1999	
Rosevean	1948	1983	1999			
Rosevear	1962	1975	1983			
Great Crebewthan	1974					
St Agnes	1971	1974	1992-95			
Gugh	1971	1974	1992-95			
Northern Isles						
Mincarlo	1982					
Illiswillgig	1977					
Castle Bryher	1961	1982				
Scilly Rock	1960	1982	1999			
Men-a-Vaur	1960	1982	1999			
Round Island	1915	1987	1992-99			
St Helen's	1982?					
Eastern Isles						
St Martin's Daymark	1994	1999				
Menawethen	1999					

1999 SURVEY FINDINGS

Of the twenty-two sites visited during the 1999 survey, positive evidence of breeding Storm Petrel presence was obtained from seven (Table III). Whereas at two more sites birds were trapped overnight in numbers that make it difficult to doubt breeding presence, or at least a firm commitment to the site (Table IV). Recent cat-predated petrel remains were found at three additional sites (Table V), leaving little room for doubt petrels go to ground at those sites of their own volition, for whatever reason. At one of these (Gugh) over 100 birds have been caught in a single night in recent years. Ten more sites tested using diurnal playback failed to produce evidence of breeding (Table VI). One of these, Burnt Island St Agnes, was also visited after dark, but still failed to produce evidence of presence, even though this site has produced trapped birds during past overnight visits

Away from the previously known colonies of Annet & Round Island, single overnight ringing sessions were carried out at three other sites during the 1999 survey, Samson, St Martin's Daymark and Menewethan, using a single 12m net and 8 watts portable tape player. A review was then carried out of all overnight ringing (on a daily bases) carried out since 1992 and total numbers of new birds ringed at each session were assessed against time, providing an index of new bird captures per minute (Tables VIII - XIV). As with the 1999 study, almost all past ringing sessions involved the use of a single 12m net and 8 watts portable tape player. It was then possible to compare capture rates with those on Annet and Round Island, for both of which there are known population estimates. Using these data alone it seems difficult to rule

out the probability of Storm Petrels breeding on Gugh, Burnt Island St Agnes, Daymark St Martin's or Menewethan. Though Samson may fail to qualify.

A notable feature, even for Annet, was the number of nights when captures rates fell significantly below the highs of more than one new bird per minute. To the point almost of no captures at all.

For all islands, accurate acreage sizes or reliable estimates are available. Making it possible to calculate numbers of pairs for all islands where birds were shown or are believed to be present, based on estimated levels of breeding density on Annet and Round Island. Round Island is 10 acres (4.04 ha) and about 33% appears suitable for breeding Storm Petrels. Giving an available breeding area of 13,489 m², which with a known population of 625 pairs gives a breeding density of one pair every 21 m².

Although Annet comprises 53 acres (21.44 ha) an even greater percentage appears unsuitable, e.g. extensive areas of Thrift and Bracken, and with birds apparently confined to only part of the area of boulder beaches available to them (Robinson & Haw in prep). Therefore, on the assumption that perhaps only one sixth of the island is suitable breeding habitat, this produces a figure of 35,742 m², which if divided by the known 1,700 pairs, also gives a density of one pair per 21 m².

However it is important to note that in many areas, on both islands, pairs are much more densely distributed. For example the two 1997 Annet study beaches produced densities of 0.8 and 0.4 pairs per metre², suggesting pair totals of 16.8 and 8.4 pairs respectively at the following 10 and 21 m² figures. Also, whilst surveying Melledgan for the present survey approximately 10 birds were counted on one 20 metre² section. For this reason two estimates are provided for each of the following sites, one at 21 m² and one at half that figure, i.e. 10 m², giving a higher density.

In the Mediterranean Balearic Islands Amengual *et al* (1999) recorded a density of between 483 and 654 pairs (using capture-recapture data) on an island of just 0.56 ha, one quarter or less the size of many of the islands involved in the current survey. Interestingly, 0.56 ha translates into 5584 m² which, if divided by the Annet and Round Island assumed densities of one bird per 21 m² and 10 m², suggests population levels of 265 and 558 breeding pairs. Or 54% and 85% respectively of the actual totals obtained at the Mediterranean site using capture-recapture.

Considering first the five remaining islands that produced evidence of breeding presence. Three, Melledgan, Gorregan and Rosevear, are each approximately five acres (2.02 ha), or 20,234 m² in extent. Most of Gorregan appears suitable for breeding petrels, suggesting a possible total of 963 pairs at just one pair every 21 m², or 2,023 at a theoretical density of one pair every 10 m². Totals for Gorregan and the following sites also appear in Table I.

Because, in the case of Melledgan and Rosevear, perhaps only 50% (10,117 m²) of the total area appears suitable for Storm Petrel occupation, a theoretical density each of one pair every 21 m² produces 481 pairs. Whereas a density of one pair every 10 m² suggests 1,011 pairs

Although each occupies perhaps only 3 acres (1.21 ha), both Scilly Rock and Man-a-Vaur appear even more suited to Storm Petrels (certainly the latter). In which case total areas of 12,140 m² for each island could produce pair totals in the order 578 at one pair per 21 m², or

1,214 at one pair every 10 m². In which case, the possible combined population of just these five islands falls in the range 3,081 - 6,473 pairs.

Of the ten islands failing to produce diurnal evidence of petrel presence, two, Mincarlo and Illiswilgig, also appear eminently suited, plus birds have been recorded on both in past years (Table II). In addition, several other apparently suitable islands could not be visited and on these too there is a recent history of birds being recorded, e.g. Castle Bryher, Rosevean and Great Crebewthan. Five islands in total, each about 3 acres and each theoretically capable of holding 578-1,214 pairs; total 1,734 - 3,642.

Nothing has yet been said about those sites producing substantial numbers of trapped birds, but nevertheless lacking reliable evidence of breeding. At Gugh and St Agnes the existence of between-year re-traps (Scillonian Seabird Group - unpublished data) argues in favour of breeding, leaving just the question of numbers involved. Though comparisons of trapping totals with those for Annet and Round Island suggest numbers may be less. In which case we may do no better at this stage than suggest an arbitrary figure of perhaps 300 pairs for each site.

Which, if we ignore sites producing only cat-predated remains, leaves only Menawethan and St Martin's Daymark. The former comprises 7 acres (2.83 ha), about half of which appears unsuitable. In which case the comparable possible pair totals based on the above assumptions are 674 and 1,416. However we should not overlook any likely effects of rat presence at this island site, though there seems no obvious way of measuring that at this stage. Although a predation rate of 50% seems high it might be a safe figure to use at this stage. In which case the likely pair total would fall in the range of 337 - 708.

The Daymark site poses a rather different problem. Clearly only a very small part of the total the island's 640 acres is involved and local knowledge suggests it may be in the range of 3 acres (1.2 ha), taking in the large boulder area along the foot of the Daymark escarpment (pers obs). Producing figures of 578 to 1,214.

Although an attempt was made to approximate the age of six Storm Petrel chicks from boulder beach nests on Annet, tarsus lengths of all six fell above the 19.5mm maximum required for reliable assessment (Gilbert & Hemsley 1996; Ratcliffe *et al* 1997). However the estimated 1998 mean hatch date for Annet was around 3rd August (Robinson & Haw in prep), whilst B Cadiour (in lit) suggested that in Brittany in 1999 laying occurred earlier than normal.

The first 1999 survey site visit was to Samson, on 10th July, whereas the last was to White Island Samson and three of the Northern Isles on 5th August. However as the sample of young birds examined fell outside the required range for estimating age, it was not possible to say whether the survey might have benefited from commencing one to two weeks earlier. Though this would then have overlapped with fieldwork for the Seabird 2000 and tern surveys.

SEABIRD 2000 FINDINGS

The 1999 Storm Petrel survey coincided with fieldwork in Scilly for the nation-wide 'Seabird 2000' count of all breeding seabirds, plus an English Nature survey of tern distribution and abundance in the islands (Robinson 1999). The Seabird 2000, Storm Petrel and tern results appear in Appendix I, less data for Manx Shearwater, which was not counted in 1999. Excluding Storm Petrel (and Manx Shearwater) a total of 7,704 pairs of seabirds of eleven

species was recorded at 50 sites. With the addition of the Storm Petrel survey findings, the total number of seabird pairs breeding in the Isles of Scilly is between 17,515 and 25,094. Which if translated into individuals falls in the range 35,030 to 50,188 birds. To which must be added a probably 500-700 Manx Shearwater pairs (1,000 – 1,400 birds).

CONCLUSIONS

Between 9,811 and 17,390 pairs of Storm Petrels may breed at 16 sites known to hold these birds, or previously recorded as having done so. Making it by far the most abundant breeding seabird occurring in the Isles of Scilly, with 3,500 pairs of Lesser Black-backed Gulls being the next most abundant. If these figures are correct then more Storm Petrels breed in Scilly than all other seabirds combined. As Scilly is the only recorded English breeding site for this species these figures also represent the total known English population.

Storm Petrels may also be breeding, or attempting to breed at a number of additional sites, as supported by evidence of cat-predated petrel remains. Also, the observed substantial rat and cat presence at a number of potentially suitable sites, notable (in the case of rats) in the Eastern Island and on inhabited islands, may substantially be limiting the species' ability to increase its standing within the islands. With a likely similar effect on other seabirds, but notable perhaps Manx Shearwater and Atlantic Puffin. A further 7,704 pairs of other seabirds of eleven species breed in the islands, plus Manx Shearwaters, which were not surveyed in 1999.

DISCUSSION

It has become increasingly fashionable to try estimating petrel distribution and abundance using diurnal tape playback, e. g. Gilbert & Hemsley (1996); Ratcliffe *et al* 1997; Robinson & Haw (in prep). But doubts remain over the reliability of this method, which can produce varying results from differing habitats, or from different field workers. One obvious disadvantage is the importance to this method of seasonal timing, requiring prior knowledge of laying or hatching dates, plus the effects on survey results of miscalculating these. For example, during 'Seabird 2000' survey work on 14th June, Storm Petrels were heard calling from two areas of Gorregan. Whereas during diurnal playback for the Storm Petrel survey on 18th July none of these birds responded, even though some were subsequently shown to be present.

Therefore, for these and other reasons the concept of perfecting diurnal tape playback as a universal means of assessing petrel breeding numbers and usable by all (Ratcliffe *et al* 1997) may still escape us.

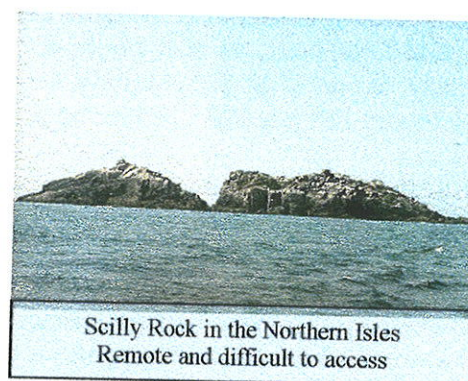
One other method available to researchers for assessing numbers of breeding birds at petrel colonies is the use of capture-recapture, with the number of marked birds recaptured used to calculate the overall number present. Past criticism of this particular method revolves around the assumption that an unknown percentage of birds trapped will be non-breeders, which are known to visit colonies, plus the probable need to standardise methods and capture times.

Amengual *et al* (1999) worked on the Mediterranean sub-species of Storm Petrel *H.p.melitensis* in the Spanish Balearic Islands, concluding that an underestimate of the effective number of birds involved seems to be the general trend in any evaluation. Also pointing out that populations can be very high even on very small islets. On one Balearic island of 0.56 hectares (Bledes) they estimated between 483 and 654 pairs using capture-recapture; with the difference largely accounted for by a reduction in numbers of pre-breeders present towards

the end of incubation. This estimate was based on five night's of trapping, each session lasting seven hours (35-hours total trapping time) and with 20m of netting plus taped petrel calls (8 watts) employed on each occasion.

The same researchers concluded that what appears to be a widely held belief that Storm Petrel estimates using capture-recapture data are confused by the presence of non breeders does not hold true, or at least not throughout the season and not at their study sites. Finding non-breeders present during pre-egg and incubation stages, but largely absent from July onwards. At the same sites, previous attempts to estimate population size using the normally accepted methods of (a) listening for calls of breeders at colonies, (b) using diurnal tape-playback to detect breeders, and (c) searching for the characteristic musty petrel smell issuing from likely nest sites, all produced unreliable results. The researchers emphasised the fact that the original estimate for the population on the small archipelago of Cabrera (Araujo *et al* 1977) was between 11 and 33 pairs, with a subsequent estimate of around 44 pairs based on numbers of eggs and chicks counted annually (Aguilar unpub data). Whereas the capture-recapture data places this population in the range 300 to 400 pairs; as the authors themselves point out, a ten-fold increase on the previous most optimistic figure.

And to further complicate the situation, there may be evidence of geographical variation in key behavioural features. For whilst Amengual *et al* (1999) recorded a decline in numbers of non-breeders after hatching, this may not hold true for sites in Shetland – perhaps linked to differences in daylight length at differing latitudes (D Okill per com). In which case the Isles of Scilly are situated somewhere between these two extremes.



One further point of interest arising from the Balearic study was the high level of philopatry demonstrated by breeding birds. An important point if we consider past suggestions of between-year desertions at some Scillonian breeding sites. One explanation for this suggested absence of Storm Petrels during earlier Scillonian surveys, which, importantly, pre-dated use of diurnal playback, is that birds may indeed have been calling, but from so far underground they could not be heard. As happens apparently with attempts to survey Manx Shearwaters on Bardsey Island (K Wilson pers com) and as was thought to happen at one of two Annet study sites in 1997/98 (Robinson & Haw - in prep). Or simple that they did not call at all - it may be rather irrational to expect a bird species to routinely call simply because it is at its nest, of all places.

Also, suggestions of between-year site desertions from Scillonian islands, allegedly by whole populations, conflict with basic understandings of seabird site fidelity, including petrels generally. And nothing appears to have been printed since to refute the assertion of Fisher and Lockley (1954) that once the adult tubenose has bred successfully it probably remains faithful to the same site for the rest of its life.

Equally troublesome to the 1999 survey were its findings, using diurnal taped playback, of Storm Petrel absence from several islands in the Western and Northern Isles previously shown to hold birds. Several of which, e.g. Mincarlo, appear admirably suited still to Storm Petrel breeding needs. And whilst, in the case of the Eastern Isles, it is tempting to blame petrel

absence on the presence of rats, capture rates (new birds per minute) at both Menewethan and St Martin's Daymark fall well within the comparable range for Annet and Round Island (Tables XI & XII).

A main weakness of the 1999 study is the lack of capture-recapture data for those sites where birds were either confirmed as present for the first time during this survey, or where past records of apparent breeding presence were reconfirmed. Enough, though, is already known about recent estimates of population levels on both Annet and Round Island to suggest caution in interpreting what appear to be very small numbers of breeding birds. On Round Island, for example, even by the end of 1992, calculations based on capture-recapture data (Durham pers com 1992) indicated 625 pairs, whereas the author's own attempts to find active nest sites indicated numbers around 5% of that figure or less. Only after ten or so overnight visits, over eight years, is it becoming apparent Durham's figure is realistic.

The Annet population estimates are equally enlightening. Allen's 1974 figure of 1,600 pairs was based on crude estimate of night-time numbers of calling birds below ground, but nonetheless was close to Durham's 1992 recapture analysis of 1,500, though he thought this might include birds from nearby St Agnes and Gugh. Whereas both figures are close to the 1997 total of 1,640 pairs, calculated from diurnal playback results (Robinson & Haw in prep). Additionally, as part of the present study, capture-recapture data were examined for the nights of 7th and 13th July 1994, producing a population prediction of 1,715 pairs.

Outwardly there appears to be a measure of agreement in the results arrived at from these differing methods. However the 1992 and 1994 Annet capture-recapture data may actually be sampling only sections of the population and there is a strong suggestion in the data that birds display philopatry even between sub-colonies on individual islands (Scillonian Seabird Group – unpublished data). Thus the actual number of Annet pairs may well be greater. Indeed, from what we already know of discrepancies between population estimates using both capture-recapture data and more 'traditional' survey methods, e.g. diurnal playback, or night-time counts of calling birds below ground, it would be surprising if recapture data did not produce a substantially more optimistic figure.

McKee (1968) examined recapture data from ringed Storm Petrels at Irish sites. Finding low percentages of controls and high percentages of re-traps at known breeding sites, whereas the converse applied at sites where petrels did not breed. This fits comfortably with ringing re-trap data from both Annet and Round Island (Scillonian Seabird Group - unpublished data) but may raise questions in respect of St Martin's Daymark and Menawethan. At the first of which 125 new birds in 210 mins on 14th – 15th July 1999 (one every 0.59 mins) produced an additional eight controls (6.4%) but no recaptures from a similar one-night session in July 1994. Whilst on Menawethan 190 mins ringing on 31st July – 1st August 1999 produced 48 new birds (one every 0.25 mins) plus three controls (6.25%). As this was the first time this site had been netted there could be no re-traps.

The presence of both rats and Cats at what are important seabird sites must be matter of considerable concern, the more so once the findings of this survey are taken into account. The successful clearance of the uninhabited 96 acre island of Samson was carried out by the Isles of Scilly Seabird Group during winters 1991/92 and 1992/93 and demonstrates how relatively simple the task can be, given adequate resources and full commitment. Whereas clearance work elsewhere since that time by Isles of Scilly Environmental Trust (IOSET) appears to have been substantially less effective. With most islands involved in the programme

apparently still occupied by these animals. Although the islands are owned by the Duchy of Cornwall all untenanted land, including most coastal and all uninhabited islands (except Round Island), are managed by IOSET. However IOSET has no jurisdiction over Tresco.

Batten *et al* (1990) considered the Red Data listing of Storm Petrel in Britain, thinking it possibly vulnerable to the trampling of nests or nest sites by herbivores. As part of IOSET's 'Isles of Scilly Environmental Management Plan' calls for controlled grazing of certain areas this may need revising in relation to known or suspected Storm Petrel sites. It should also be noted that even though most seabird breeding islands in Scilly are closed to the public during summer, this ceases to have effect by late August. By which time most Storm Petrel and Manx Shearwater young are still confined to boulder beaches or nest burrows, raising the important question of whether the closed period should be extended in respect of certain key islands or sites, e.g. Annet.

If, as is suggested by the Brittany petrel breeding data (B Cadiour in lit), laying occurred earlier in Scilly in 1999 this may help explain any lack of response to diurnal playback during some of the later site visits. However past Storm Petrel survey work on Annet suggests that if work commences too early the survey may not benefit from an ability to detect both calling adults and small young, with the latter frequently calling whilst still tended by adults (which may not call). Though this advantage may perhaps be limited to shallow areas of boulder beach, where chicks are closer to the surface and thus more likely to be heard.

Clearly findings contained in this report are based on limited fieldwork and include some as yet unproven assumptions, though they do incorporate the results of several years of ringing and survey work from some of the islands involved. Also there is continuing discussion among researchers over what is the most beneficial path to pursue. Nevertheless, given the continuing widespread lack of knowledge about what is, after all, an abundant breeding species throughout much of Britain and Europe, plus the urgent need to make some kind of evaluation of the Scillonian population, the report should be viewed for what it is. A reasoned first attempt at evaluating the distribution and abundance of Storm Petrels throughout the Isles of Scilly. There can be little doubt this subject will need revisiting, in which case the contents of this report will hopefully serve as an obvious starting point.

Table III
Island Sites with Positive Proof of Breeding Presence – 1999

Site	OS Ref	Past Presence?	Night/Day?
Melledgan Island	SV862063	Yes	Day
Gorregan Island	SV848056	Yes	Day
Rosevear Island	SV839059	Yes	Day
Scilly Rock	SV860156	Yes	Day
Men-a-Vaur Island	SV894175	Yes	Day
Round Island	SV902177	Yes	Night
Annet Island	SV863085	Yes	Night

Table IV
Island Sites with Numbers of Petrels Trapped at Night
But Lacking Proof of Breeding – 1999

Site	OS Ref	Past Presence?	Night/Day?
Daymark (St Martin's)	SV942163	Yes	Night
Menawethern Island	SV955137	No previously checked	Night

Table V
Island Sites with Evidence of Cat Predation but
lacking Evidence of Breeding Presence

Site	OS Ref	Past Presence?	Night/Day?
Kittern Rock (Gugh)	SV888088	Yes	Night
Gweal Hill (Bryher)	SV871151	Not checked	Day
Giant's Castle (St Mary's)	SV925101	Not checked	Night

Table VI
Island Sites Providing no Response to Diurnal Playback

Site	OS Ref	Past Presence?	Day/Night?
Mincarlo Island	SV853129	Yes	Day
Illiswilgig Island	SV859139	Yes	Day
White Island Samson	SV871127	Not checked	Dayx2
Guther's Island	SV919144	Not checked	Day
Middle/Great Arther Island	SV941137	Not checked	Day
Ragged Island	SV947138	Not checked	Day
Little Ganinnick Island	SV934136	Not checked	Day
Burnt Island (St Agnes)	SV873087	Yes	Day/Night
Shipman Head (Bryher)	SV873164	Not checked	Day
Tresco North End	SV887166	Not checked	Day

TABLE VII
Nightly Capture Rates for 'New' Birds - Annet

Date	Number Caught	Time (in minutes)	New Birds per min
Annet 'A'			
July 14, 1992	201	290	0.69
July 21, 1992	215	210	1.02
May 25, 1993	3	30	0.30
June 29, 1993	270	170	1.58
July 7, 1993	209	220	0.95
August 4, 1993	13	?	?
June 28, 1994	141	180	0.78
July 7, 1994	219	235	0.93
July 13, 1994	157	227	0.68
September 12, 1994	1	?	?
August 8, 1995	50	220	0.22
July 18, 1996	4	?	?
June 12, 1996	144	200	0.72
July 15, 1997	15	?	?
July 23, 1997	214	223	0.95
August 8, 1997	2	?	?
August 12, 1997	82	155	0.59
July 18, 1999	53	126	0.42
Annet 'B'			
August 4, 1993	427	390	1.09
August 8, 1995	145	270	0.53
July 23, 1996	239	250	0.95

TABLE VIII
Nightly Capture Rates for 'New' Birds – Round Island

Date	Number Caught	Time (in minutes)	New Birds per min
July 16, 1992	201	310	0.64
July 23, 1992	216	270	0.80
June 29, 1993	114	250	0.45
June 26, 1994	66	240	0.27
July 5, 1994	93	?	?
August 6, 1995	104	175	0.59
June 18, 1996	31	155	0.20
August 20, 1997	34	220	0.15
July 28, 1999	68	255	0.26

TABLE IX
Nightly Capture Rates for 'New' Birds – Gugh

Date	Number Caught	Time (in minutes)	New Birds per min
July 12 1992	111	180	0.61
June 27, 1993	69	118	0.58
July 4, 1993	91	150	0.60
August 1, 1993	55	245	0.22
June 30, 1994	12	80	0.15
July 3, 1994	14	?	?
July 20, 1995	138	182	0.75
August 10, 1995	27	185	0.14
July 13, 1997	2	60	0.03
1999?			

TABLE X
Nightly Capture Rates for 'New' Birds – St Agnes (Burnt Island)

Date	Number Caught	Time (in minutes)	New Birds per min
July 17, 1992	70	155	0.45
July 19, 1992	57	135	0.42
July 4, 1994	50	?	?
June 5, 1995	34	130	0.26

TABLE XI
Nightly Capture Rates for 'New' Birds – St Martin's (Daymark)

Date	Number Caught	Time (in minutes)	New Birds per min
July 29, 1994	86	212	0.40
July 14, 1999	125	210	0.59

TABLE XII
Nightly Capture Rates for 'New' Birds – Menewethan

Date	Number Caught	Time (in minutes)	New Birds per min
July 31, 1999	48	190	0.25

TABLE XIII
Nightly Capture Rates for 'New' Birds – St Mary's (Peninnis)

Date	Number Caught	Time (in minutes)	New Birds per min
August 6, 1993	16	70	0.22

TABLE XIV
Nightly Capture Rates for 'New' Birds – Samson

Date	Number Caught	Time (in minutes)	New Birds per min
July 7, 1998	4	73	0.05
July 10, 1999	2	50	0.04

SITE ACCOUNTS in respect of TABLE III

Melledgan

Area of Island – 5 acres (2.02 ha) (estimate).

Brief Description of Island - Remote, sparsely vegetated low rocky island with flat central area surrounded by substantial boulder beach, perhaps 2-3 metres deep. Strong seabird breeding presence, i.e. Great Cormorant, European Shag, Great Black-Backed and Herring Gull, Razorbill and Atlantic Puffin (2-3 pairs).

Petrels - Visited mid-day 30th July. Small number of birds responding to tape at two locations among smaller boulders on inner edge of main peripheral boulder beach, with at least two young also heard. Density of about 10 birds per 20 square metres at one location. Tape played at various locations above main boulder beach but depth involved of up to 2-2.5 metres and impossible to say whether birds deep within.

Gull Predation - Strong Great Black-backed Gull breeding presence (28 pairs) but no indication of avian petrel predation, i.e. no pellets found containing petrel remains.

Rat Predation - No sign of rat presence and none known previously, very probably because island washed over by winter seas.

Gorregan

Area of Island – 5 acres (2.02 ha) (estimate).

Brief Description of Island - Remote, rugged, un-vegetated rocky island, with vertical pinnacles and horizontal beds of smooth rock, interspersed with boulder scree containing deep-seated small caves and recesses. Strong breeding seabird presence, e.g. Northern Fulmar, European Shag, Herring and Lesser Black-backed Gulls, Common Guillemot, Razorbill and Atlantic Puffin.

Petrels - Visited mid-day 14th June (to count auks), when several birds heard calling from beneath large boulders at three locations in centre of island, without use of tape. Three birds heard and seen calling within small cavern deep beneath large boulders, also occupied by Common Guillemots.. Visited again on 18th July with tape and got no response, though two birds still visible in small cavern and two birds and single chick heard from third site not located during June visit.

Gull Predation - No indication of avian petrel predation, i.e. no pellets found containing petrel remains.

Rat Predation - No sign of rat presence and none known previously, very probably because island washed over by winter seas.

Rosevear

Area of Island – 5 acres (2.02 ha) (estimate).

Brief Description of Island – Remote, sparsely vegetated rocky seabird island, with flat central area surrounded by substantial, cc. 2m deep, boulder beach. With remains of stone-built house used by constructors of nearby Bishop Rock lighthouse. Separated from un-vegetated, more rugged, seabird

island of Rosevean by narrow (cc. 30 metre) channel. Other breeding seabirds European Shag, Great Black-backed and Herring Gull, plus Razorbill.

Petrels – Landed mid-afternoon 25th July and checked boulder beach using tape. No response but four birds answered from within cc.4m section of low wall remains of house. Nest with egg and incubating bird seen. Another bird answering from small area of smaller stones at NW end of boulder beach.

Gull Predation – No evidence of gull predation, e.g. in gull pellet containing petrel remains, despite strong Great Black-backed Gull presence (95 pairs).

Rat Predation – No sign of rat presence and none known previously, very probably because island washed over by winter seas.

Scilly Rock

Area of Island – 3 acres (1.21 ha) (estimate).

Brief Description of Island – Flat-topped bare rocky outcrop and seabird breeding island. Precipitous and difficult to access, according to state of tide. One of only three breeding sites for Common Guillemot in Scilly; other breeding seabird species European Shag, Herring and Lesser Black-backed Gulls, Razorbill, Atlantic Puffin.

Petrels – Visited mid-day 5th August. Two adults answered tape on southern edge of upper platform but unable to access several likely looking scree areas lower down on south face. Young chick also heard calling near adults.

Gull Predation – No evidence of avian predation, e.g. in gull pellets, despite presence of Great Black-backed Gull (1 pair) and 10 pairs of Herring Gull.

Rat Predation – No sign of rat presence and none known previously, very probably because washed over by seas in winter.

Men-a-Vaur

Area of Island – 3 acres (1.21 ha) (estimate).

Brief Description of Island – Precipitous, bare rocky island and seabird breeding site. Divided into three north-south aligned sections, with only the westerly section accessed 'easily'. The second of just three Common Guillemot breeding sites in Scilly. Other breeding seabird species Northern Fulmar, European Shag, Razorbill, Atlantic Puffin.

Petrels – Visited mid-day 22nd June. Bird heard calling from area of large rocks near summit on east side of western section. Tape not played at this site.

Gull Predation – No indication of avian petrel predation, i.e. no gulls breeding at this site and no gull pellets found containing petrel remains.

Rat Predation – No sign of rat presence and none known previously, very probably because island washed over by winter seas.

Round Island **Area of Island** – 10 acres (4.04 ha).

Brief Description of Island – Larger precipitous, flat-topped island with substantial amounts of low vegetation, e.g. Thrift, Mesembreanthemum, Sea Beet. Contains unmanned Lighthouse and thus under control of Trinity House. Other breeding seabird species Northern Fulmar, Manx Shearwater, European Shag, Herring, Lesser and Great Black-backed Gulls.

Petrels – Recent estimate of 625 pairs based on ringing re-trap data. Birds on eggs or with young located during overnight visit on 28th July and 67 new birds ringed, a rate of 0.26 per minute, using low-level tape recording under net. Estimate of calling numbers below ground in region of 4-5 per two metre² in some areas.

Gull Predation - No indication of avian petrel predation, i.e. no pellets found containing petrel remains, though few found in past years.

Rats Predation - No evidence of rat presence found during visits over last seven years and island believed free of rats (and all other mammals); perhaps owing to past clearance work by Trinity House staff?

Annet

Area of Island - 53 acres (21.44 ha).

Brief Description of Island - Large, low, uninhabited and well vegetated (primarily Thrift, Bracken and grasses) island, surrounded by substantial areas of boulder or storm beach. A (perhaps the) main known stronghold of breeding Storm Petrels in Scilly, with recent estimates of 1,600 - 1,700 pairs. Other breeding species Northern Fulmar, Manx Shearwater, Herring, Lesser and Great Black-backed Gulls, Razorbill, Atlantic Puffin, plus three to four passerine species. A continuing feature is the large concentration of breeding Great Black-backed Gulls (137 pairs).

Gull Predation - Known ongoing problem involving Great Black-backed Gulls but probably not excessive, if judged by numbers of pellets found containing petrel remains.

Rat Predation - No historical or recent evidence of rat presence, and only known land mammals are Rabbit and Lesser White-toothed Shrew.

SITE ACCOUNTS in respect of TABLE IV

Daymark

(St Martin's)

Total Area of Island - 640 acres (259 ha).

Brief Description of Site - Steeply sloping and overlooking open sea to north, with extensive areas of very large boulders and rock outcrops, well vegetated with low plants (mainly Thrift, but with Bracken higher up). Apparently suitable area extends for 2-3 hundred metres, perhaps more. Also numerous Rabbit burrows.

Brief Description of Island - One of five large inhabited islands, with medium habitation and agriculture, but with extensive areas of heath and extensive amounts of sea cliff and associated accumulations of large boulders at north-east corner. Other breeding seabird Northern Fulmar, Manx Shearwater (probably), Herring, Lesser Black-backed and Great Black-backed Gulls, Black-legged Kittiwake.

Petrels - Long reported as present at site. First tested in July 1994, when 86 birds trapped and ringed in 3 1/2 hours. Visited again in heavy mist in July 1998 and no birds caught over cc.2 hours. Visited overnight on 14th July during survey and 128 new birds trapped and ringed in 3 3/4 hours.

Gull Predation - No evidence of this but three large gulls nest close by.

Rat Predation - No evidence of predation but rats present on island and no obvious reason why they should be absent.

Cat Predation - No evidence of predation, but Cat watching from within rocks during trapping session in July 1999.

Menawethan

Size of Island - 7 acres (2.8 ha).

Brief Description of Island - Well vegetated (Sea Beet, Thrift, grasses) steep-sided but with level summit. Substantial rocky outcrops on west, south and east sides. Other breeding seabirds Northern Fulmar, European Shag, three large gulls, and single pair of Razorbills. Atlantic Puffins have been

observed prospecting in recent years and a long-dead skull found among rocks at the eastern end.

Petrels – Not previously tested for petrel presence. Visited overnight 31st July and 48 birds trapped and ringed in 3 ½ hours. Tape played over various rock areas during daylight but no response. Same areas visited after dark but no birds heard. Nevertheless birds still flying around tents and lower sections of island well after trapping ceased.



Menawethan in the Eastern Isles
The most well-vegetated group

Rat Predation – Island seriously infested with animals. Numerous sightings throughout night, including two animals together. Earlier visit recorded cc.25 Northern Fulmars on eggs along northern slope, but just two young surviving on 31st July.

Cat Predation – Animals not known to be present (uninhabited) and no evidence found.

SITE ACCOUNTS in respect of TABLE V

Kitten Rock (Gugh)

Total Area of Island – 93.86 acres (37.98 ha).

Brief Description of Island – Fully vegetated and inhabited (two houses), attached to the larger St Agnes at low tide and accessible to the public (and mammals). Rocky outcrops at various points inland away and boulder beaches at several points.

Description of Site (Kitten Rock area) – Steep, well-vegetated area with numerous rocky outcrops, and with boulder beaches close by. Full extent of petrel presence unclear.

Petrels – Know previous presence with total of 520 birds ringed 1992-95 (cc8 visits – 66 new birds per session, plus re-traps). Cat kills show birds come ashore at night but breeding remains unproven. Other breeding species Manx Shearwater, Herring, Lesser and Great Black-backed Gulls (one pair of latter), plus Black-legged Kittiwake close by.

Gull Predation – None recorded, despite presence of 1,300 pairs of large gulls.

Rats – Present on island and on St Agnes. No evidence of rat predation of petrels, though there is for nearby Kittiwakes.

Cats – Domestic and/or feral cats on island. Cat-predated petrel remains found at site over seven years.

Gweal Hill (Byher)

Total Area of Island – 308 acres (124.64 ha).

Brief Description of Island – Inhabited, well-vegetated island with simple agriculture in central areas and numerous rocky outcrops around shore. Plus some areas of boulder beach on west coast. Other breeding seabird species, perhaps none.

Description of Site (Gweal Hill NW) – Well vegetated (mainly Thrift) rocky outcrop on NW side of Gweal Hill, above shore. Full extent of petrel interest unknown, but may be very local, though apparently suitable boulder beach close by (cc. 400m).

Petrels – Past report of birds responding to tape in area of site but not tested subsequently. Visited mid-day 20th July and beach tested unsuccessfully for response to tape. Remains of cc.25 fresh cat-kills found, all in one spot on rocky outcrop.

Gull Predation – No evidence and no breeding gulls present.

Rats – Present on island but effect on this site unknown.

Cats – Clear evidence of cat predation (see 'Petrels' above).

Giant's Castle (St Mary's) **Total Area of Island** – 1476 acres (597 ha).

Brief Description of Island – Main inhabited island, with extensive habitation, agriculture, airport, etc. Only other known breeding seabirds are two pairs of Herring Gulls on rooftops in Hugh Town.

Description of Site – Extensive rocky outcrop on south side of island facing open sea. Well vegetated (mainly Thrift) around base of large boulders and exposed pinnacles. Similar area of rock extends for several hundred metres along shoreline but extent of occupation if any, not known. Exact site where cat-predated remains found used regularly by island's clay pigeon shooting club. Visited at dusk 19th August and net erected and tape played for 2 ½ hours. No birds caught.

Petrels – Dead petrel found close by (apparently undamaged) July 1999, plus cc 3 cat-predated remains found all at same place on rock mid August 1999.

Gull Predation – No evidence and none breeding within perhaps two kilometres (either on Gugh, or in Hugh Town).

Rat Predation – Rats widespread on island and droppings evident under rocks at site.

Cat Predation – Evidence of feral cats (droppings) all along among rocks from site westwards. Cat watching from under rocks whilst tape playing on 19th August.

Hedgehogs – Not endemic but introduced to St Mary's within last ten years or so, now widespread throughout island.

SITE ACCOUNTS in respect of TABLE VI

Mincarolo

Size of Island – 3 acres (1.21 ha) (estimate).

Brief Description of Island – Isolated, remote, rugged, sloping, and sparsely vegetated (Tree Mallow, Sea Beet) seabird island. Breeding seabird species Northern Fulmar, Great Cormorant, European Shag, three large gulls, Razorbill, Atlantic Puffin, Common Guillemot (one pair). Numerous deep holes under boulders, with many Puffin holed going even further underground. Appears admirably suited to Storm Petrels, both physically and from its location, close to deep water and open sea.

Petrels – Visited morning of 25th July. Tape played over suitable areas but no response. 'Cold' searching also tried but no response.

Gull Predation – No evidence, though three large gulls breed.

Rat Predation – Not previously know to be present, perhaps because island washed over by heavy seas.

Cat Predation – Not know to be present (uninhabited) and no evidence found.

- Illiswilgig** **Size of Island** – 3 acres (1.21 ha) (estimate).
Brief Description of Island – Isolated, remote, rugged, sloping, and sparsely vegetated (Tree Mallow) seabird island. Breeding seabirds European Shag, Herring and Great Black-backed Gulls, Razorbill.
Petrels – Visited 5th August and tape played over apparently suitable areas, but no response. Appears admirably suited to Storm Petrels, both physically and from its location, close to deep water and open sea.
Gull Predation – No visible evidence.
Rat Predation – Animals not known to be present, perhaps because island washed over by heavy seas.
- White Island (Samson)** **Size of Island** – 4 acres (1.6 ha).
Brief Description of Island – Low, well vegetated (Sea Beet, Bracken, grasses, Thrift) with flat central area surrounded by boulder beach on east and west sides. Approximately 150 metres from Samson's west beach. Other breeding seabird Great Cormorant (1 pair - first breeding record for island), European Shag, Herring, Lesser and Great Black-backed Gull.
Petrels – Visited 12th July and 5th August during daytime and played tape over all of boulder beach. No response.
Gull Predation – No indication of petrel presence in form of gull pellets.
Rat Predation – No evidence of rat presence since island cleared of animals along with adjacent Samson winters 1991/92 and 1992/93.
Cat Predation – None present on island.
- Guther's Island** **Size of Island** – 0.5 acres (0.20 ha) (estimate).
Brief Description of Island – Very small, isolated rocky outcrop in shallow water, with small shell-sand beach and medium vegetation, near centre of island group. Other breeding seabirds European Shag, Herring and Great Black-backed Gulls. Former Sandwich Tern breeding site.
Petrels – Visited during daylight 3rd August and tape played over likely habitat. No response. Small rocky areas perhaps suitable petrel habitat.
Gull Predation – No indication of petrel presence from gull pellets.
Rat Predation – No evidence of rats seen and perhaps too small for them. Though other islands in Eastern Isles are heavily infected, as must be nearby St Martin's, which is accessible on foot at low tides, albeit over several hundred metres of wet sand.
Cat Predation – Not present – too small.
- The Arthers** **Size of Islands** – 19 acres (7.68 ha).
AR-THURS **Brief Description of Island** – Group of three 'joined' islands at western end of Eastern Isles and heavily vegetated, with rising central areas and lacking boulder beaches apart from good c70 metre section between Middle and Great Arther. Plus one or two apparently suitable rocky outcrops. Breeding seabirds Northern Fulmar, Lesser Black-backed Gull (1 pair), Herring and Great Black-backed Gulls.
Petrels – Visited during daylight on 3rd August and tape played over boulder beach and around two rocky outcrops. No response.
Gull Predation – No indication of petrel presence from gull pellets.

Rat Predation – No indication of petrel presence from rat kills, but numerous evidence of rat presence all over, e.g. holes, runs, droppings, including in and around boulder beach.

Cat Predation – No evidence of prior knowledge of cat presence – too isolated?

Ragged Island **Size of Island** – 1.5 acres (0.60 ha) (estimate).

Brief Description of Island – Small, isolated rocky island with minimal vegetation, in deep water near centre of Eastern Isles. Other breeding seabirds Great Cormorant, European Shag, Herring and Great Black-backed Gulls, perhaps Razorbill.

Petrel – Visited during daylight on 3rd August and tape played over likely areas. No response.

Gull Predation – No evidence of petrel presence in form of gull pellets.

Rat Predation – Numerous signs of rat presence, e.g. holes, runs, droppings. Previously tested positive for rat presence cc1993.

Cat Predation – No evidence of cat presence and no past knowledge of their presence. Too isolated?

**Little
Ganinick**

Size of Island – 3 acres (1.2 ha).

Brief Description of Island – Smallish well-vegetated island at western end of Eastern Isles, with medium-high ground. Rocky outcrop looks suitable for petrels. Other breeding seabird species European Shag, Herring and Great Black-backed Gull.

Petrels – Visited during daylight on 3rd August and tape played over suitable habitat. No response.

Gull Predation – No evidence of petrel presence in form of gull pellets.

Cat Predation – No evidence and no prior knowledge of cat presence.

**Burnt Island
(St Agnes)**

Size of Island – 4 acres (1.61 ha).

Brief Description of Island – Extensive low boulder beach with flat sparsely vegetated central area and small rocky outcrop. Other breeding seabird species – none know. Attached to adjacent, larger St Agnes at low tide and about half kilometre from main breeding site of Annet.

Petrels – Site visited during daylight 22nd July and tape played over beach. No response. Visited again same night and tape played and listened for calling birds. No response to tape and no birds heard. Site previously netted at night and birds caught (Table X), though no direct evidence of breeding. Difficult to judge from ringing re-trap data whether site has own breeding population, or if co-specific with Annet/Gugh sites.

Gull Predation – No evidence of petrel presence found in form of gull pellets.

Rat Predation – No evidence of rats seen, but accessible from St Agnes, which has them.

Cat Predation – No evidence of cat predation during this visit, but remains of petrel kills matching know cat kills from elsewhere seen here on past occasions.

**Tresco
(North End)**

Size of Island – 771 acres (312 ha).

Brief Description of Island & Site – One of five large inhabited islands. Rugged north end exposed to open sea and with several rocky outcrops

similar to site where cat-predated petrel remains found on Bryher, plus limited areas of boulder beach. Other breeding seabird species in close proximity Herring, Lesser and Great Black-backed Gulls, Black-legged Kittiwake, Common Tern.

Petrels - Site visited 21st July and tape played over suitable habitat, including rocky outcrops. No response. Net set at nearby position for one hour during darkness cc.1996 but no birds trapped, though past reports of birds here.

Gull Predation - No evidence of petrel presence in form of gull pellets.

Rat Predation - No evidence of rat predation but animals know to be present and to predate other seabird species on island. Visual evidence of rat presence at rocky outcrops being inspected, e.g. droppings.

Cat Predation - Know cat problems on island at other nearby seabird sites and no reason why absent from this area.

Shipman Head Size of Island - 5 acres (2.02 ha) (estimate).

(Bryher)

Brief Description of Island - Isolated, high and rugged rocky platform separated from remainder of Bryher by narrow, deep channel, passable with care at low tide. Faces north into deep water. Outer (northern section) washed clear of vegetation, whereas inner section sparsely vegetated (mainly Thrift). Other breeding seabird species European Shag, Herring, Lesser and Great Black-backed Gulls. Recently also Black-legged Kittiwake. Manx Shearwater suspected.

Petrels - Visited 20th July and tape played over all likely habitat. No response. No recorded previous presence.

Gull Predation - No evidence of petrel presence in form of gull pellets.

Rat Predation - No evidence of rat presence seen or previously know, but they are on Bryher and difficult to see why absent.

Cat Predation - No evidence seen or previously know. Known to be a problem on nearby Bryher and could gain access of own accord.

TABLE XV
Scientific Names of Species Mentioned in the Text

Species	Scientific Name
Northern Fulmar	<i>Fulmarus glacialis</i>
Manx Shearwater	<i>Puffinus puffinus</i>
Storm Petrel	<i>Hydrobates pelagicus</i>
Great Cormorant	<i>Phalacrocorax carbo</i>
European Shag	<i>Phalacrocorax aristotelis</i>
Skuas	<i>Stercorarius/Catharacta sp</i>
Lesser Black-backed Gull	<i>Larus fuscus</i>
Herring Gull	<i>Larus argentatus</i>
Great Black-backed Gull	<i>Larus marinus</i>
Gulls, large	<i>Larus sp</i>
Black-legged Kittiwake	<i>Rissa tridactyla</i>
Sandwich tern	<i>Sterna sandvicensis</i>
Common Tern	<i>Sterna hirundo</i>
Common Guillemot	<i>Alca aalge</i>
Razorbill	<i>Alca torda</i>
Atlantic Puffin	<i>Fratercula arctica</i>
Cat	<i>Felis domesticus</i>
Hedgehog	<i>Erinaceus europaeus</i>
Rabbit	<i>Oryctolagus cuniculus</i>
Lesser White-toothed Shrew	<i>Crocidura suaveolens</i>
Brown Rat	<i>Rattus norvegicus</i>

Bracken	<i>Pteridium sp</i>
Sea Beet	<i>Beta maritima</i>
Thrift	<i>Armeria maritima</i>
Dwarf Pansy	<i>Viola kitaibeliana</i>
Mesembryanthemum sp	<i>Disphyma or Drosanthemum sp</i>

ACKNOWLEDGEMENTS

Many people helped with survey work and preparation of this report but particular gratitude goes to those who assisted with long hours in the field, particularly during over-night visits to remote islands. The latter included Hayley Ashwell, Mark Barratt, Peter Clement, Shani Course, Paul Derbyshire, Erin Down, Allan Drewitt, John Holmes, David Mawer, Rebacca Nasson, Roger Peart, Ruth Points, Darryl Saunders, Hanne Tatchell and Kester Wilson. Like many previous Scillonian seabird surveys this one benefited from the navigational skill and local knowledge of Cyril Nicholas, whilst Hicks and Sons, Bryher Boats and the St Mary's Boatman's Association all assisted with transport between island. Peter Clement provided helpful advice during preparation of this report and commented on the draft, as well as giving guidance on methodology. Whilst the Duchy of Cornwall provided information on the size of islands. I am also grateful to Martin Scott for drawing attention to the probably presence of Storm Petrels at Giant's Castle on St Mary's. The Isles of Scilly Environmental Trust kindly agreed to the survey being carried out on land managed by themselves and the joint John Muir - Duke of Edinburgh Residential Course assisted with obtaining biometric data from nestling Storm Petrels. I must also acknowledge information provided by Bernard Cadiou on the timing of Storm Petrel breeding in Brittany. Apologies to those I have overlooked.

REFERENCES

- ANNONYMOUS (1995): **BIODIVERSITY: THE UK STEERING GROUP REPORT – VOLUME 2: ACTION PLANS**; HMSO
- ANNONYMOUS (1981): **Wildlife and Countryside Act 1981**; HMSO.
- ALLEN, R. (1994): **GULLS AND OTHER SEA-BIRDS IN THE ISLES OF SCILLY, APRIL TO AUGUST, 1994**; unpublished report to English Nature
- BATTEN, L. A., BIBBY, C. J., CLEMENT, P., ELLIOTT, G. D. & PORTER, R. F. (1990): **Red data Birds in Britain**; Poyser.
- BIBBY, C. J., BURGESS, N. D. & HILL, D. A. (1992): **Bird Census Techniques**; British Trust for Ornithology and Royal Society for the Protection of Birds.
- BIRKIN, M. & SMITH, A. (1987): **BREEDING SEABIRDS - ISLES OF SCILLY 1987**; unpublished report to English Nature
- CRAMP, S. (Ed) (1977-1994): **Handbook of the Birds of Europe the Middle East and North Africa – The Birds of the Western Palearctic**; Royal Society for the Protection of Birds
- CRAMP, S., BOURNE, W.R.P. & SAUNDERS, D. (1974): **THE SEABIRDS OF BRITAIN AND IRELAND**; Collins, London
- FISHER, J. & LOCKLEY, R. M. (1954): **SEA - BIRDS**; Collins.
- GILBET, G. & HEMSLEY, D. (1996): **A Survey of Storm Petrels *Hydrobates pelagicus* on the Treshnish Isles 1996**; Royal Society for the Protection of Birds
- GUERMEUR, Y. & MONNAT, J-Y. (1980): **HISTOIRE ET GEOGRAPHIE DES OISEAUX NICHEURS DE BRETAGNE**; Societe Pour L'Etude Et La Protection De La Nature En Bretagne.
- HARVEY, P. (1987): **Breeding Seabird Population - Isles of Scilly 1983**; unpublished report to English Nature
- LLOYD, C., TASKER, M. L. & PARTRIDGE, K. (1991): **The Status of Seabirds in Britain and Ireland**; T & A D Poyser, London
- LYSTER, S. (1985): **INTERNATIONAL WILDLIFE LAW**; Grotius.

- McKEE, N. D. (1982): **Factors relevant to the estimation of colony size of the Storm Petrel (*Hydrobates pelagicus*)**; unpublished MSc dissertation New University of Ulster
- PENHALLURICK, R.D. (1969): **BIRDS of the CORNISH COAST**; D Bradford Barton. Truro
- PRITCHARD, D. E., HOUSDEN S. D, MUDGE, G. P., GALBRAITH, C. A. & PIENKOWSKI, M. W. (1992): **Important Bird Areas in the United Kingdom, including the Cannel Islands and the Isle Of Man**; RSPB
- RATCLIFFE, N., VAUGHAN, D., WHYTE, C. & SHEPHERD, M. (1998): **THE DEVELOPMENT OF PLAYBACK CENSUS METHODS FOR STORM PETRELS *Hydrobates pelagicus***; Bird Study 45 (302-312) British Trust for Ornithology.
- ROBINSON, P. (1991): **SEABIRD MONITORING ON SCILLY 1991/92**, unpublished report
- ROBINSON, P. (1992a): **1992 (SEABIRD) WORK RECORD**; unpublished report
- ROBINSON, P. (1992b): **REVIEW OF SEABIRD MANAGEMENT AND RESEARCH ACTIVITIES IN 1992**; Isles of Scilly Seabird Group, unpublished report
- ROBINSON, P. (1992c): **BREEDING SEABIRDS IN THE ISLES OF SCILLY**; unpublished report to English Nature
- ROBINSON, P. (1993): **BREEDING SEABIRDS IN THE ISLES OF SCILLY**; unpublished report to English Nature
- ROBINSON, P. (1994): **TERNs AND KITTIWAKES IN THE ISLES OF SCILLY IN 1994**; unpublished report to English Nature
- ROBINSON, P. (1995): **BREEDING SEABIRDS IN THE ISLES OF SCILLY – 1995, TERNs, KITTIWAKES AND ALL SPECIES ON ANNET**; unpublished report to Isles of Scilly Environmental Trust
- ROBINSON, P. (1998): **SEABIRD SURVEY AND MONITORING REPORT – ISLES OF SCILLY 1998**; unpublished report to Isles of Scilly Environmental Trust
- ROBINSON, P. J. (1999): **THE BREEDING STATUS OF TERNs IN THE ISLES OF SCILLY – Current and Historical Review**; unpublished report to English Nature
- ROBINSON, P. & HAW, J. (in prep): **STORM PETRELS ON ANNET – DIURNAL TAPE PLAY-BACK AND AN ESTIMATION OF BREEDING PHENOLOGY**; in prep
- TASKER, M.L. (1991): **SEABIRD CONSERVATION IN SCILLY**; unpublished report
- THOMAS, C. (1985): **Exploration of a Drowned Landscape – Archaeology and History of the Isles of Scilly**; Batsford.
- WAGSTAFF, W. (1996): **BREEDING SEABIRDS IN THE ISLES OF SCILLY – 1996, Terns, Kittiwakes and all species on Annet – All-island count of Shag nests**; unpublished report to Isles of Scilly Environmental Trust
- WAGSTAFF, W. (1997): **SEABIRDS IN THE ISLES OF SCILLY**; unpublished report to Isles of Scilly Environmental Trust
- WALSH, P.M., HALLEY, D. J., HARRIS, M.P., del Nevo, A., SIM, I.M.W. & TASKER, M.L. (1995): **SEABIRD MONITORING HANDBOOK FOR Britain and Ireland**: JNCC/RSPB/ITE/Seabird Group, Peterborough

APPENDIX I
Seabird 2000 Results
Plus Terns and Petrels

Site	FULMA	MANSH	CORMO	SHAG	LBGUG	HERGUG	GBBGUG	KITTI	SANTE	ROSTE	RAZOR	GULL	PUFFI	TOTALS	COMTE	STOPE MIN	STOPE MAX	USABLE ACRES	ACTUAL ACRES
St Mary's						2	2							2					1,476
St Agnes		?			2	25								27	3				327
Burnt Is (St Agnes)																300	300	4	4
Gugh + Bow & Cow	2	x			1123	159	3	155						1442		300	300	1.5	94
Annet	21	x		209	517	42	137				4		47	977	1	1,700	1,700	8.83	53
Melledgan			16	105			28				6		2	157		481	1,011	2.5	5
Gorregan	2			74	1						64	39	1	181		963	2,023	5	5
Rosevean				30	2		1				4			37		578	1,214	3	5
Rosevear				117		2	95				11		3	228		481	1,011	2.5	5
Great Crebawethan				5	1									6		578	1,214	3	3
Mincarlo	15	?	25	82	2	6	23				70	1	53	277		578	1,214	3	3
Illiswilgig				25		8	12				7			52		578	1,214	3	3
Maiden Bower					5	1	1							7					1
Gweal		?		105	4	15	62							186					16
Scilly Rock				39	2	10	1				22	39	25	138		578	1,214	3	3
Castle Bryher	13			22		1	2				4			42		578	1,214	3	3
White Island (Samson)		?	1	32	27	15	39							114					4
Samson	2			7	1062	184	5	38						1298	11				96
Green Island (Samson)														0	7				0.25
Puffin Island				4	108	31	2							145					3
Shipman Head		?		4	50	23	13							90				?	5
Bryher		?												0	1				303
Tresco		?			29	102		54						185	52				771
Merrick Island + Plumb										x				0	13				0.25
Green Island (Tresco)														0	1				0.25
Men-a-Vaur	16			24							101	117	25	283		578	1,214	3	3
Round Island	33	x		3	1	8	5							50		625	625	3.33	10
St Helen's		?			530	64	6	7					11	618					49
Norwethel					13	10	18							41					12
Foremans Island						5	1							6					0.5

APPENDIX I

Seabird 2000 Results

Plus Terns and Petrels

Site	FULMA	MANSH	CORMO	SHAG	LBBGU	HERGU	GBBGU	KITTI	SANTE	ROSTE	RAZOR	GULL	PUFFI		COMTE	STOPE MIN	STOPE MAX	USABLE ACRE	ACTUAL ACRE
Crow's Island						3	3						6						0.25
Peashopper Island							1						1		1				0.25
Half-tide Rock							1						1						0.25
Great Cheese Rock													0		5				0.25
Hedge Rock							2						2						0.25
Tean + Pednbrose					24	62	16						102		1				40
Plum Island						6							6						0.25
Pernagie Isle							11						11						1.5
White Island (St Martin's)	5	?			28	34	2						69						38
St Martin's	32	x			58	18	3	27					138			578	1,214	3	640
Guther's Island				1		18	29						48						0.5
Great Ganinick				23	2	2	21						48						5
Little Ganinick				25		6	32						63						3
Great/Little Arther	3				1	8	34						46						19
Little Ganilly							20						20						7
Nournour					1	3	6						10						4
Great Ganilly	4				9	13	32				?		58						35
Ragged Island			12	39		9	18				1		79						1.5
Great Innisvovuls	7	?	2	69		3	50						131						5
Little Innisvovuls				28			10						38						3
Menawethan	27			37	6	5	63				1		139			337	708	3.5	7
Hanjague	2										1		3						
SPECIES TOTALS	184	0	56	1109	3608	903	808	281	0	0	296	196	167	7608	96	9811	17390	55.16	4,074
SSSI sites shown in red															7704	17515	25094		
											Other seabirds plus Common Terns								
											Minimum Storm Petrel pairs total plus all others								
											Maximum Storm Petrel pair total plus all others								
											Estimated area utilised by Storm Petrels								
											Total area of islands								

