THE CLIMATE OF LUNDY

by
GEOFF JENKINS
Yateley, Hampshire
email: geoff.jenkins.yateley@ntlworld.com

ABSTRACT

Routine weather measurements have been made on Lundy since the early 1970s, and many of these are used to establish a monthly mean climate of the island, in terms of maximum and minimum temperatures, rainfall, wind speed and a few visual observations such as days of fog and snow. In the case of rainfall, the length of data allows a full 30-year climatology to be established. In other cases, the climatology will be rather shorter and hence less robust, but still valuable. For some quantities, comparison is also made with the climate of Chivenor, N. Devon.

Keywords: *Lundy, climate, rainfall, temperatures, wind speed*

INTRODUCTION

Many of the studies that are reported in the Annual Reports and the Journal of the Lundy Field Society are of flora and fauna which are directly influenced by weather and, in the long term, climate, yet no quantitative summary of the climate of the island seems to have been published. A talk on the climate of Lundy was given to the Meteorological Society of London in June 1878 by Dr A.J.H. Crespi, and was later summarised in print (Crespi, 1878). It is largely anecdotal and qualitative, with the addition of a few spot measurements of temperatures on specific days. Sea surface temperatures around Lundy have been reported by Hiscock and Dymond (1974) for 1972 and 1973 and by Willcox (1988) for 1986 and 1987; the latter also included air temperatures for comparison.

We might expect the climate of Lundy to be different from that on the nearby coast because it is, of course, surrounded by the waters of the Bristol Channel, which will exert a moderating influence on temperatures. Its rocky shape may have an effect on winds, depending on where they are measured.

SOURCES OF DATA

Observations by the Met. Office (and, later, the Environment Agency) from Lundy comprise full weather station measurements from one site and rainfall observations from three sites (including the weather station). Details are given in Table 1.

Weather station data

A range of weather quantities (temperature, maximum and minimum temperature, rainfall amount, humidity, wind speed and atmospheric pressure) was manually recorded from an auxiliary Met. Office weather station near the South Light, together

Table 1: Details of official meteorological measurements on Lundy

Station	ID	OS Grid Ref.	Height ASL	Type	Period
South Light	WMO 03702	21441436	43m	Auxiliary	July 1972- Dec 1994
South Light	396386	21441436	43m	Rainfall	Oct 1977- Dec 1994
Stoneycroft	396384	21331443*	139m	Rainfall	May 1970-Oct 1988
Marisco	396385	21371441	114m	Rainfall	Oct 1988-present

* In 1978 the gauges were moved a few metres to this final location in the top paddock

with observations of visibility and the occurrence of rain, snow, thunder and fog. These were initially 'synoptic' measurements, made every three hours and communicated to the Met. Office to be used as input to the weather forecast, but this was later reduced to twice daily at 09Z and 21Z. The thermometers were housed in a standard 'Stevenson' screen positioned about 15m to the SW of the South Light, with a rain gauge a few metres away at ground level (43m ASL). Observations were made by Trinity House lightkeepers from 1972 until the South Light was automated in early December 1994 when the station was closed. (A previous auxiliary weather station was established at the North Light in August 1971, but closed after less than a year due to automation of the light). The South Light station was examined every few years by Met. Office inspectors, one of whom commented in his notes that the journey from Bideford was extremely uncomfortable and he 'spent most of his time avoiding other people's vomit'.

Temperature data from this station obtained directly from the Met. Office consisted of twice-daily maximum and minimum temperatures, from Jan 1984 to Nov 1994, together with the corresponding monthly means. A further source of data was discovered on the internet, in the shape of the TuTiempo (Your Weather) website. This has daily data from many weather stations all over the world; data from Lundy is at http://www.tutiempo.net/en/Climate/LUNDY_ISL_LGT-H/37020.htm. (A comparison of data from this website with that from data supplied by the Met. Office, where they overlap, shows good agreement). The website shows daily data from Jan 1974 to Nov 1994, twice as long as the data supplied by the Met. Office. However, particularly in the first decade or so, many observations are missing, so this report concentrates on the period from April 1984 when reliability is generally good, although this means that many averages are over a period of only 8 or 9 years. This is not really sufficient to give a true long-term climate, which should span 30 years of data, but does give a reasonable indication. Furthermore, the website does include more quantities (humidity, wind speed, occurrence of snow, fog, etc.) than have been obtained from the Met. Office.

Rainfall data

Rainfall has been measured at two 'high-level' sites on Lundy, Stoneycroft and Marisco Tea Garden. These used a standard 5" diameter copper gauge for daily rainfall amounts and a tilting syphon rain gauge from which shorter period extremes can be calculated (although the latter type was removed in 1993 and data from it is not used in this article).

Plate 1: The thermometer screen in the grounds of the South Light.

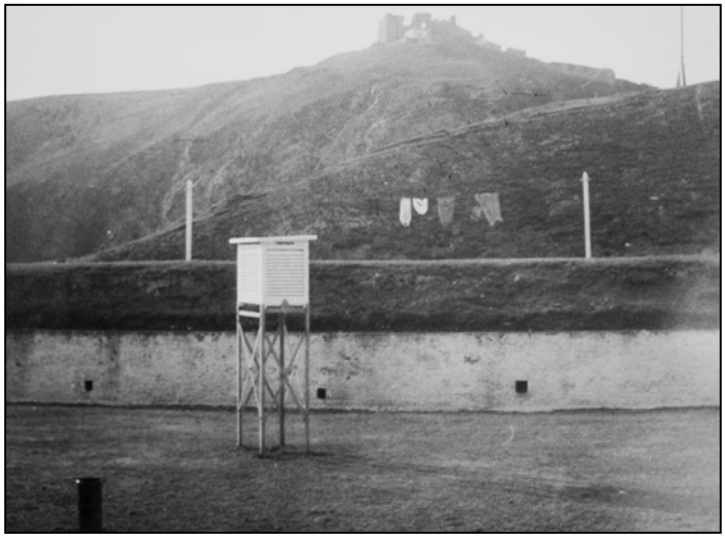

Plate 2: a different view taken during set-up in 1972, showing also the standard rain gauge at bottom left (and the lightkeepers' washing!). Photographs courtesy Met. Office Archives

In addition, the rain gauge which was a component of the South Light weather station also gave daily amounts. The Stoneycroft observations ran from 1970 but due to the retirement of the local observer the station was closed in October 1988 and the gauges moved to the Marisco Tea Garden. Observations from this site continue to the present day, responsibility having been transferred to the Environment Agency in 1999. The Lundy Warden has kindly supplied monthly rainfall data from January 1971 to December 2010, made up of data from the two high-level sites.

In two or three places in this article, I have also compared data from Lundy with that from the Met. Office station at RAF Chivenor, some 37km away on the River Taw between Barnstaple and Appledore, about 5km inland.

Other data

Weather measurements have been made from other sites. A Trinity House automatic weather station ran for some years near the South Light. The Lundy Island Company has operated a simpler Davis weather station near the Marisco tavern since 2007. Data from these two non-Met. Office sources has yet to be explored.

Plate 3: The two rain gauges in the top paddock of Stoneycroft. The smaller gauge is used for daily amounts, and the large gauge records short-period extreme rainfall rates.

Plate 4: The two rain gauges in the Marisco Tea Garden. Both photographs courtesy Met. Office Archives

RAINFALL

The combined dataset from Stoneycroft and Marisco has been used to plot mean monthly rainfall over the period 1981-2010 (the latest standard 30-year climate period), and this is shown in Figure 1, together with the monthly extremes over the period. The total annual rainfall averages 990mm but there is a clear seasonal variation; months of highest average rainfall (around 115mm) are October to December, and the lowest rainfall is in April-June (55-60mm).

Figure 2 shows a comparison with rainfall at Chivenor over the same period. The two are very similar, which is reassuring. Any differences could be real, or could be due to the different measurement heights above sea level – 6m at Chivenor and an average of 126m on Lundy.

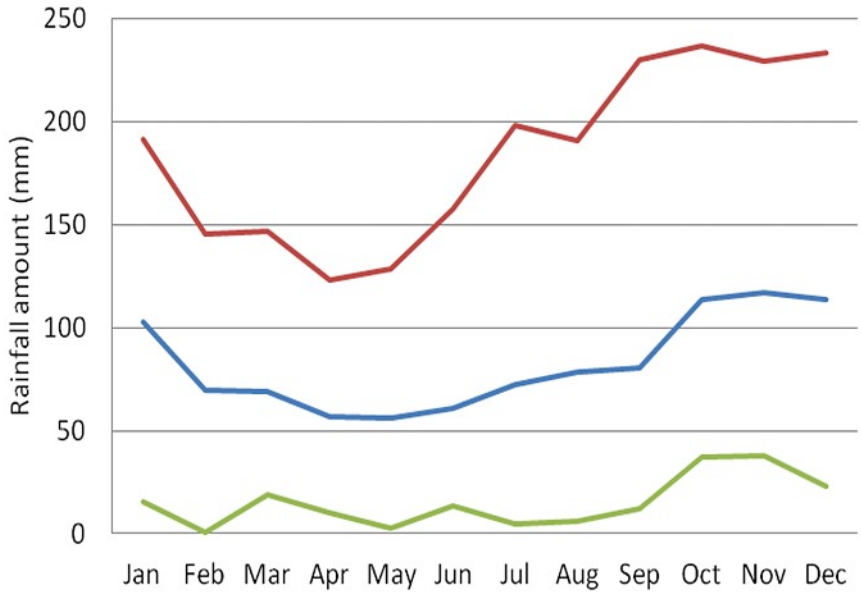

Figure 1: Mean monthly rainfall amount (blue) over the period 1981-2010 from Stoneycroft/Marisco, together with rainfall in the highest (red) and lowest (green) months in the record

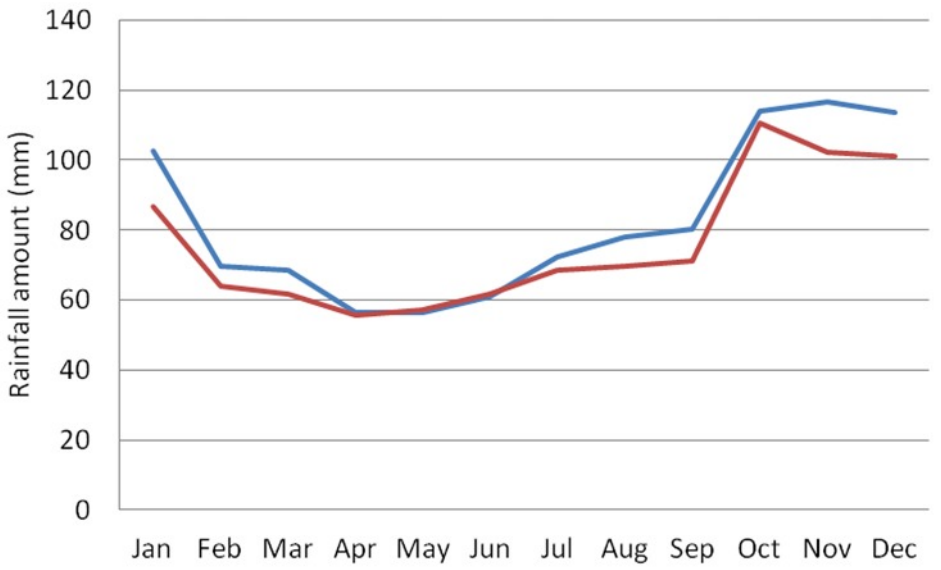

Figure 2: Mean monthly rainfall amount over the period 1981-2010 from Lundy (blue) and Chivenor (red)

Rainfall will, of course, vary from one year to the next, and Figure 3 shows this for the annual total at Lundy, with the highest (1272mm) in 2000 and the lowest being almost half as much (647mm) in 1976.

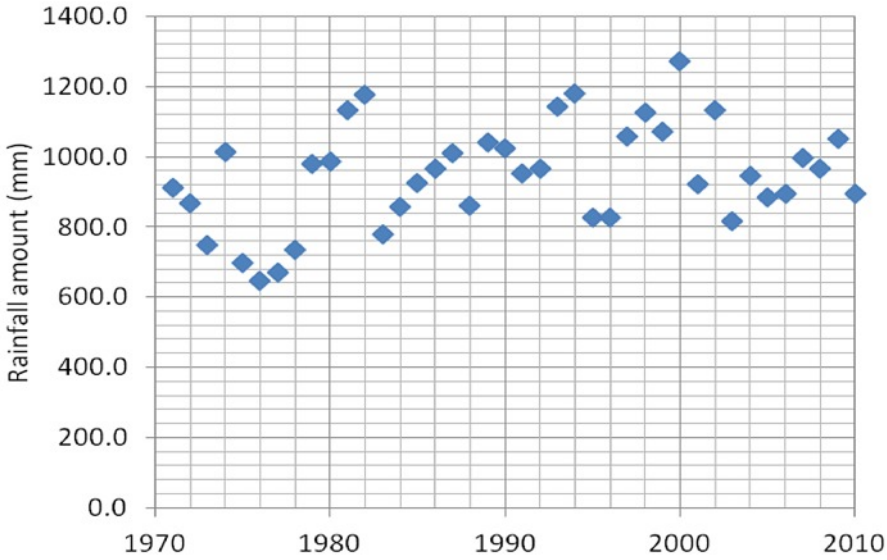

Figure 3: Total annual rainfall (Stoneycroft/Marisco) from 1971 to 2010

A comparison of monthly total rainfall at the two high-level sites with that at South Light over the period of common data, October 1977 to October 1994, is made in Figure 4. This shows a reasonable correlation between the two, with rainfall at Stoneycroft/ Marisco being on average some 25% greater than that at the South Light. This is to be expected as the former two are higher (139m and 114m) than the South Light (43m).

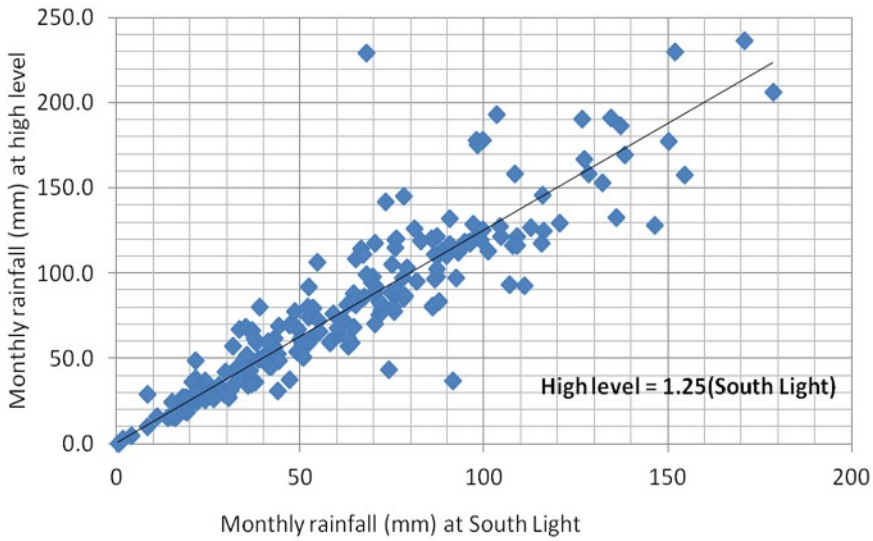

Figure 4: Relationship between rainfall at South Light weather station and that at the top of the hill (Stoneycroft/Marisco). One or two outliers could be data errors but have not been removed. Only months with full data have been used

MAXIMUM AND MINIMUM TEMPERATURES

The daily extremes of temperature at the Met. Office weather station have been used to form mean monthly extremes, and these are shown in Figure 5, together with the standard deviation of the extremes over the 13-year period. Typically, the maximum temperature peaks in July and August at 17-18ºC, and the minimum falls to 5ºC in February. Summer extremes are some 8-10ºC higher than those in winter.

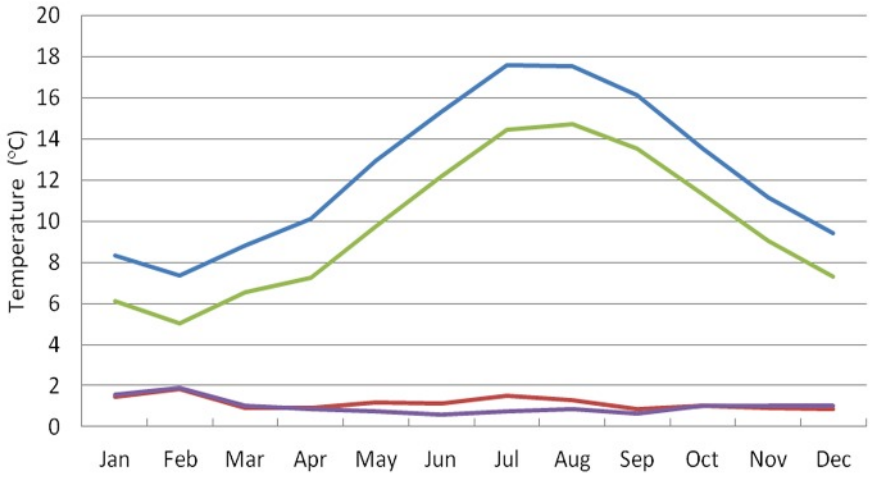

Figure 5: Monthly mean daily maximum (blue) and minimum (green) temperature over the period 1981 to 1994, with standard deviations of maximum (red) and minimum (purple)

It is interesting to compare temperature extremes at Lundy with those at Chivenor, and this is done in Figure 6, for the period April 1988 to November 1994 when observations overlapped. The ameliorating effect of the seas surrounding Lundy is immediately obvious, and is more clearly seen in Figure 7 when the two are subtracted. On average, summer maxima are some 3ºC lower on Lundy, and winter minima are 3-4ºC higher.

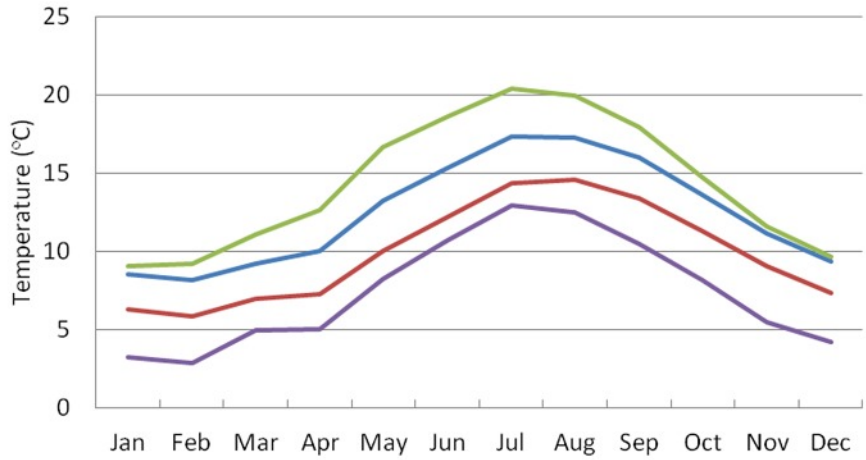

Figure 6: A comparison of mean monthly maximum and minimum temperatures at Lundy (blue and red) and at Chivenor (green and purple)

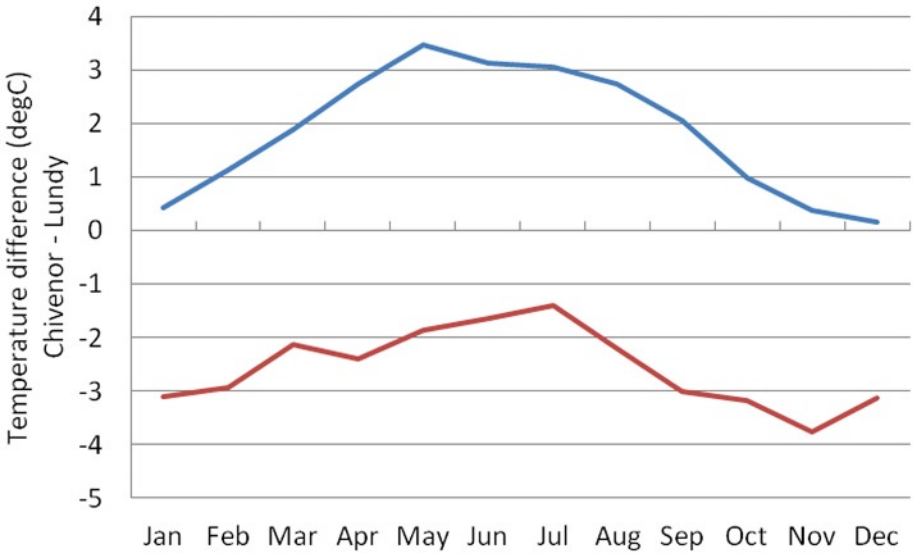

Figure 7: The difference between mean monthly maximum (blue) and minimum (red) temperatures on Lundy and at Chivenor

Another manifestation of the effect of surrounding seas can be seen in Figure 8, which shows how the daily temperature range (the difference between daily maximum and minimum) at Chivenor averages roughly 6 to 8ºC through the year, whereas at Lundy it averages only 2 to 3ºC.

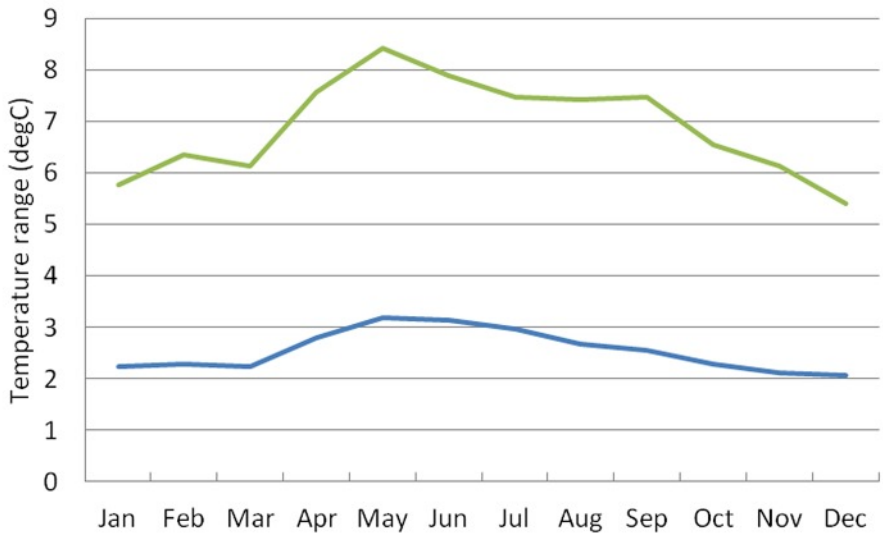

Figure 8: The difference in mean monthly extremes ('daily range') at Lundy (blue) and at Chivenor (green)

We have shown that Lundy has a different temperature climate compared to Chivenor; if compared with a station much further inland this difference would be even greater.

SEA TEMPERATURES

The moderating effects of the sea on Lundy's temperature are noted above, but what are the sea temperatures around Lundy? Figure 9 shows a plot of monthly average sea surface temperatures (SST) (a) measured at the coast at Ilfracombe (CEFAS, 2015) (although these will be somewhat different from temperatures off Lundy) and (b) scaled from Willcox (1988) taken in Landing Bay and averaged over 1986 and 1987. Isotherms on maps in Uncles and Stephens (2007) show the sea around Lundy having an average SST of 8ºC in February and 16ºC in August. Also plotted is the mean monthly (air) temperature (the mean of the maximum and minimum temperatures) for Lundy. Note, however, that the periods of these three data sets are not coincident.

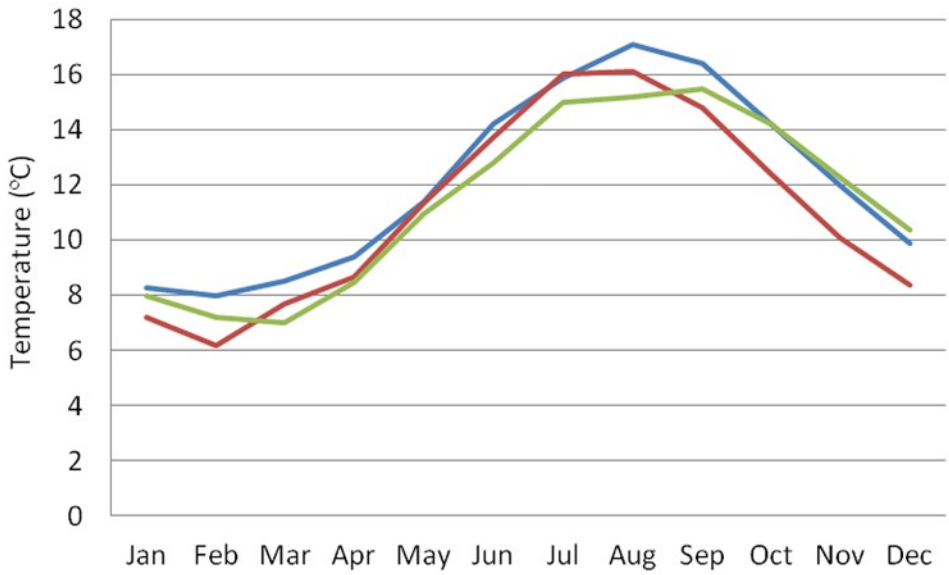

Figure 9: Monthly mean sea surface temperatures at Ilfracombe (blue) and Lundy (green), together with mean monthly air temperature at Lundy (red)

WIND SPEED

Wind speed data from the South Light has been gleaned from the TuTiempo website. It should be pointed out that these are spot-values made using a hand-held anemometer, and observations of this type can be unreliable. In addition, the enclosure of the South Light will be sheltered in some directions, but there may be an artificial speed-up in others. Figure 10 shows monthly mean wind speed (1982-1994), demonstrating a typical pattern of variation through the year, reaching 18 knots in December-January but decreasing to 11 knots in summer.

Wind speeds at Chivenor (1981-2010) are also shown on this graph, and this comparison appears to show that winds at Lundy are considerably stronger, particularly in winter, and this may indeed be the case. However, the caveats mentioned above, coupled with the fact that winds at Chivenor are measured at 10m above ground at 6m ASL, but those at Lundy are taken at 2m above ground at 43m ASL, together with the complication arising from different measurement periods, makes this comparison very difficult to interpret.

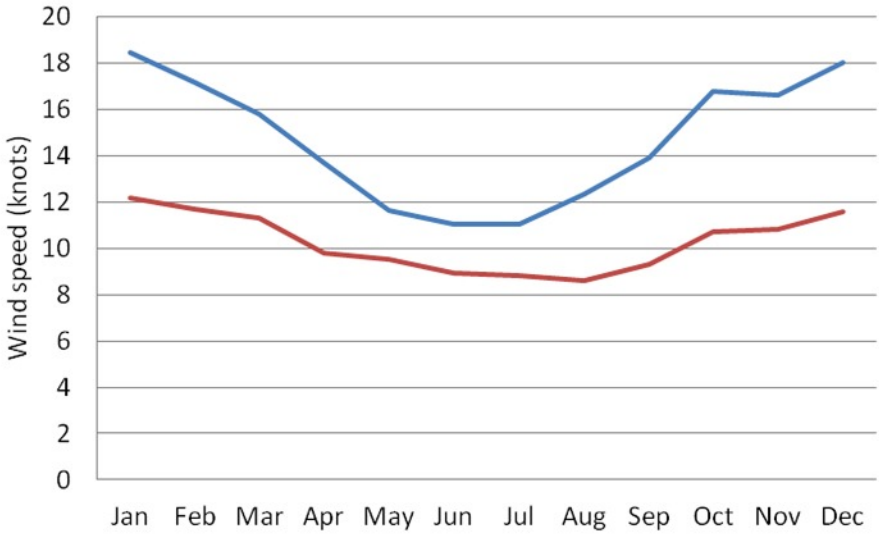

Figure 10: Mean monthly wind speed at Lundy (1982-1994, blue). Also shown is that from Chivenor (1981-2010, red)

DAYS OF RAIN, FOG, SNOW, THUNDERSTORMS

In addition to instrumental observations, the weather station observers also made daily notes of the occurrence of rain (more than 1mm), snow, fog and thunderstorms, and the monthly mean of these over the period 1981-1994 (taken from the TuTiempo website) is shown in Figures 11 and 12. Little commentary is needed, except to note the usual seasonal pattern in snowfall and in thunderstorms. Totalling the thunderstorms in all months shows that Lundy can expect 2-3 thunderstorms per year.

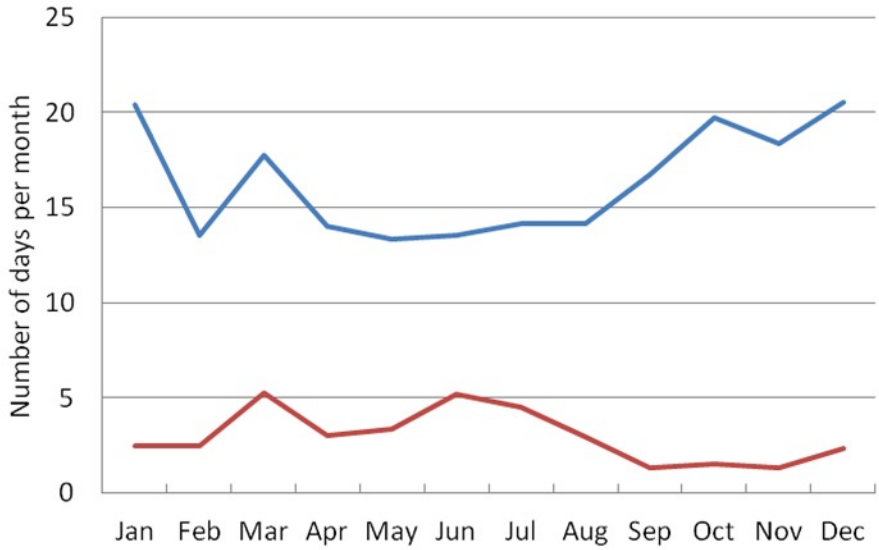

Figure 11: Number of days each month which have rain (blue) and fog (red) averaged over the period 1981-1994

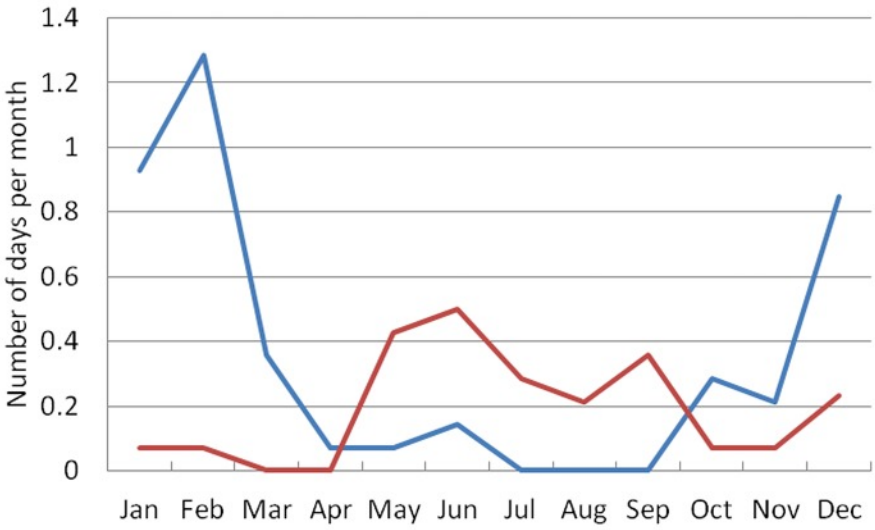

Figure 12: Number of days each month which have snow (blue) and thunder (red) averaged over the period 1981-1994

CONCLUSIONS

Such official records as are easily available have been analysed to establish a quantitative monthly climate of Lundy for the first time.

The annual average rainfall measured at the top of the island is 990mm, but with a clear seasonal pattern; twice as much falls in the months of October to December as in April to June. Rain falls on 20 days per month in winter but only 15 days in summer. Rainfall is about 20% less at the South Light than at the top.

Maximum temperatures (at the South Light) typically reach 17-18ºC in July and August, and minimum temperatures are lowest in February, averaging 5ºC. Comparison with Chivenor shows that summer maxima at Lundy are typically 3ºC lower, and winter minima 3ºC higher. The daily temperature range is only about 2-3ºC on average, compared to 6-8ºC at Chivenor.

Mean monthly wind speeds at the South Light reach 18 knots in winter but decrease to 11 knots in summer. These appear to be greater than at Chivenor, but the different measurement heights and conditions make this comparison very uncertain.

Snow falls on one day per month in December, January and February; fog averages 2-3 days per month and thunderstorms may be experienced 2-3 times a year.

ACKNOWLEDGEMENTS

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