2.1.4 Elevation data

The distribution of twite shows a concentration in the north of the country and in upland areas further south. It is evident that climate and exposure might be a critical factor in their distribution so data was obtained for elevation and climate. The Ordnance Survey's PANORAMA digital terrain model data was used as a measure of elevation (see Figure 11). This data is available from the Ordnance Survey's OpenData website (https://www.ordnancesurvey.co.uk/opendatadownload/products.html) and consists of a series of ASCII files that require to be converted individually into raster grid format using ArcGIS's ArcToolbox ***– Conversion Tools – To Raster – ASCII to Raster*** tool. The data provides a digital terrain model at 50 m resolution.

2.1.5 Climate data

The climatic data consisted of Long-term Average (LTA) Monthly Rainfall and LTA Daily Temperature data from 1961-90 from the Met Office website - United Kingdom Climate Projections (UKCP09) page in a series of 5 km gridded text files (http://www.metoffice.gov.uk/climatechange/science/monitoring/ukcp09/index.html). These files were converted to ArcGIS grid format using the ***ArcToolbox – Conversion Tools – To Raster – ASCII to Raster*** tool.

The data consists of a wide array of different climatic parameters but for this study the LTA Rainfall and Temperature values for each month of the breeding season (May to September) were isolated and used on the subsequent analysis. For both rainfall and temperature, the average value over the breeding season was calculated as a wider measure of climate (Figure 12). Ideally wind speed data would have been obtained as this has a significant role in determining exposure levels. Unfortunately, the Met Office website does not include data on wind speed and there was no other source available within the constraints of time and budge for this project.

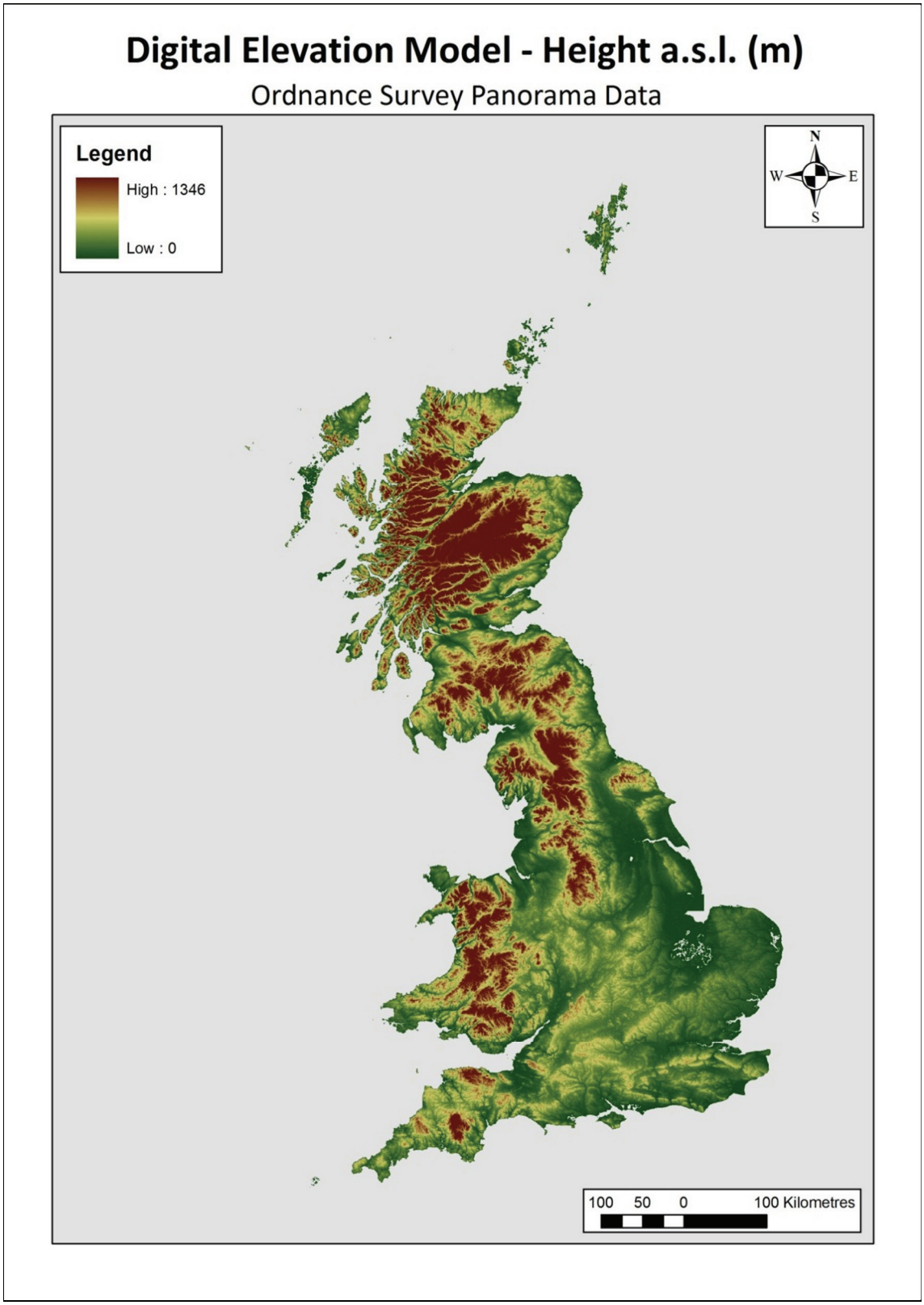

Figure 11 – Digital Terrain Model for Britain (Source: OS Panorama Data at 50 m resolution)

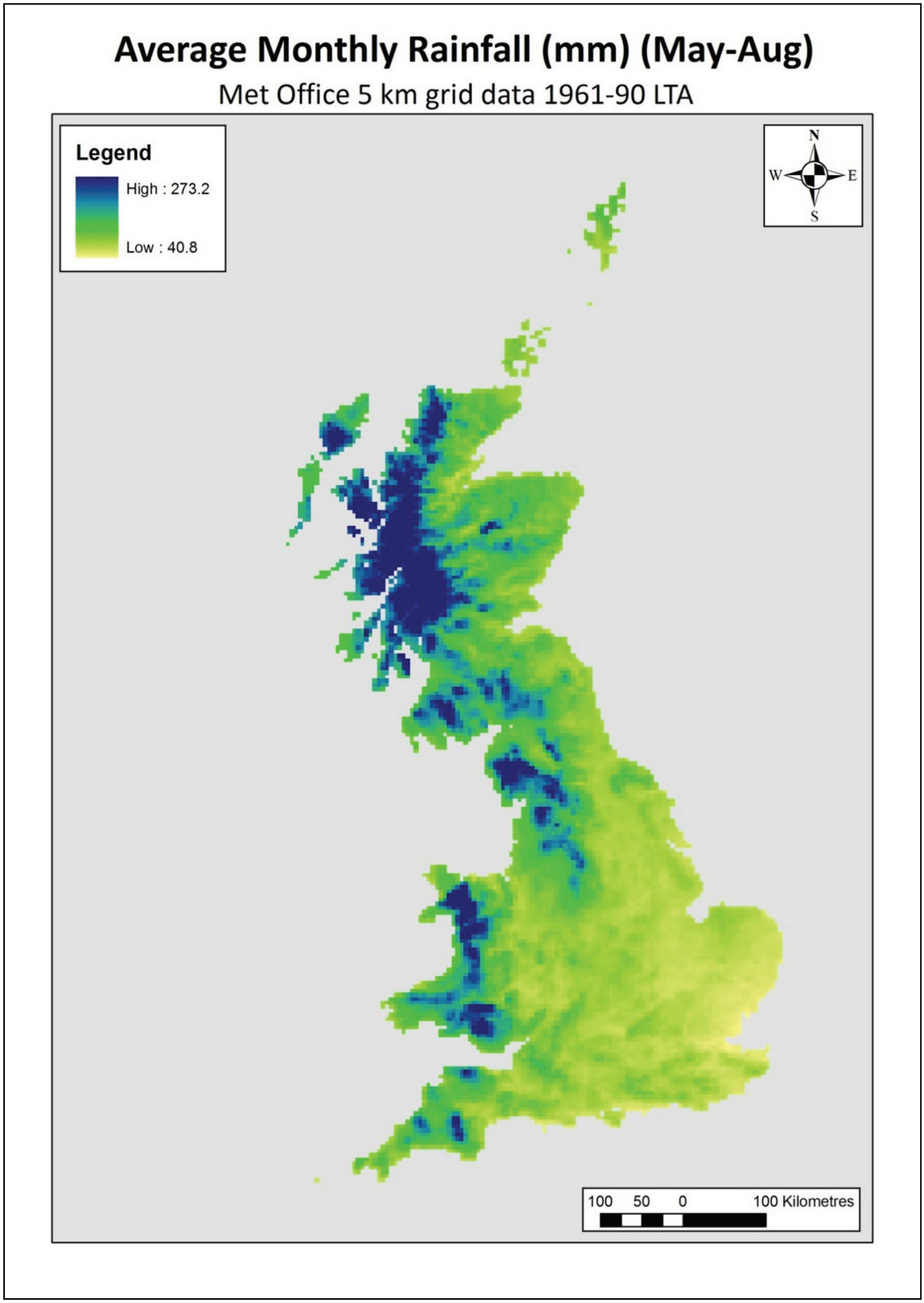

Figure 12 – Average (May-August) Monthly Rainfall for Britain

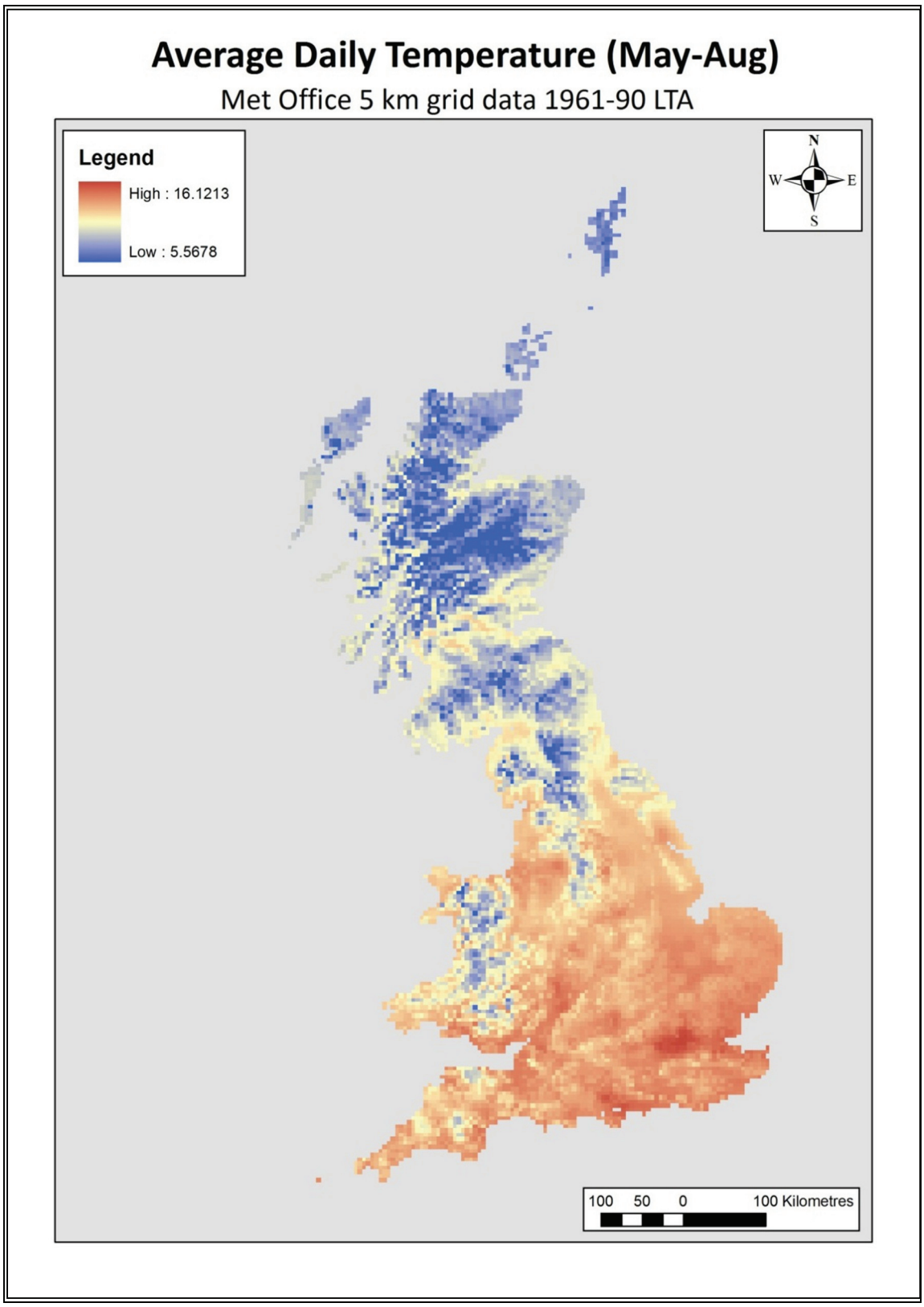

Figure 13 – Average (May-August) Daily Temperature for Britain

2.1.6 Floristic Value – South Uist

Raine (2006) estimated a 'Flower Score' for sites where twite had been recorded which reflected the relative value of the sites in terms of food plants. It was decided that this might prove to be a useful measure in predicting the distribution of twite in other areas as well. Hence, a simple field survey was undertaken by the author in South Uist during June and July 2010 to estimate a 'Flower Score' for sites where twite had been recorded in 2003-05 by Wilkinson & Wilson (2010). Six plant species were considered to be critical for twite at different stages of the breeding season (see Table 4 – Key food plants for twite during the breeding season).

Plant Species	**Common Name**	**Critical Period**
Taraxacum vulgare	dandelion	May 60% - June 30%)
Montia fontana	blinks	May 15% - June 10%)
Erodium cicutarium	common stork's-bill	June 25% - July 10%)
Rumex acetosa	common sorrel	July 10% - August 20%)
Cirsium vulgare	thistle	July 10%)
Leontodon autumnalis	Autumn hawkbit	July 20% - August 40%

Table 4 – Key food plants for twite during the breeding season

A simple method of recording presence or absence and abundance of the six most critical food plants was derived (see Appendix 4 - Flower Score Survey Methodology for details). A score of 0 to 2 was allocated to the general vicinity of each twite record (within approximately 50 m): 0 = absent; 1 = present; 2 = abundant. Thus the maximum combined score could be 12 where all six species were present and abundant, and the minimum score would be 0, where none of the six species were present. Figure 14 shows the relative abundance of twite at the locations surveyed by Wilkinson and Wilson in 2003-05 which were used for basis of this field survey.

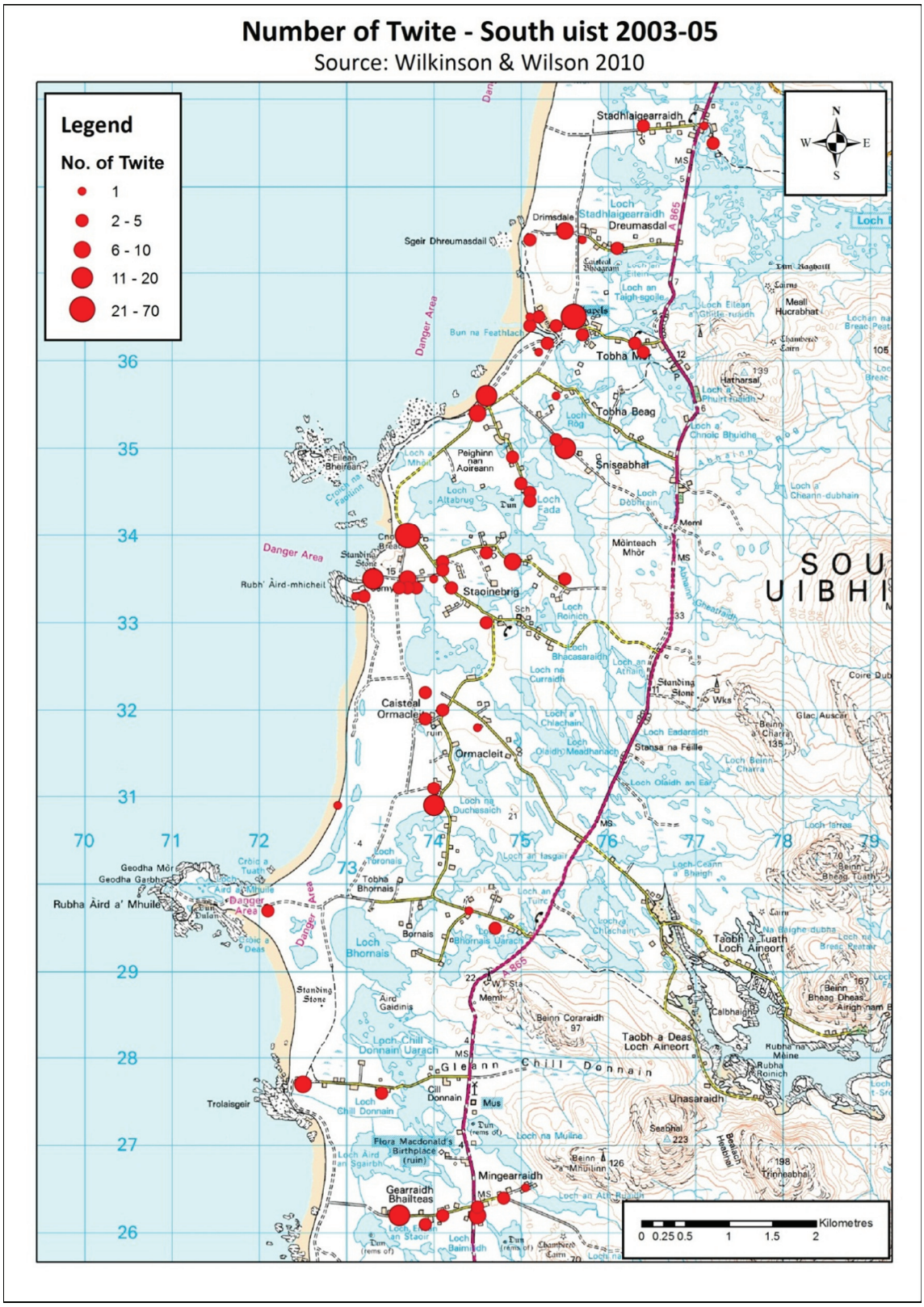

Figure 14 – Twite abundance in South Uist 2003-05 (Wilkinson & Wilson 2010)