Geography Teachers Association

Teacher Resource Papers
February 2008

Foreword

This is the seventh edition of the resource papers issued by the Geography Teachers Association. Just like last year's edition, this year's collection has not been published in the traditional paper format. This is being done for several reasons but one of the most notable is that the paper format was severely limited in possibilities when one considers the expense. Another, equally good reason is the environmental saving of a considerable amount of paper. Computers are now present in practically all homes and the advantages of the extra space and facilities offered by a DVD far outweigh the "browsing factor" of the paper format. In any case, it is easy for anyone to print the desired section of the DVD should the need for a hard copy arise.

As in previous years, this year's collection has been organised into a series of sections. Part I contains a number of articles which should help geography teachers in deepening their knowledge regarding the Maltese environment and its management. In this respect, Everaldo Attard and Joe Callus have presented an innovative paper dealing with the value of pollen, in Malta, as a bioindicator. In fact, the monitoring of pollen concentrations over time, delivers detailed information on droughts and desertification processes in the Maltese Islands. Another article is presented by Joe Sultana who writes about the Flora of the Maltese Islands. This article is written in Maltese and readers are asked to turn on their Maltese Fonts in order to facilitate reading. Matthew Vella provides an interesting discussion regarding conflicts in the use of water resources within the Fiddien area. Anton Quitano's article is a very different type of contribution since it deals with a historical theme. It is a fascinating insight into the geographical knowledge of the Maltese and Knight-mariners of the eighteenth century. This collection of articles concludes with a contribution by George Attard and myself regarding soil problems in Malta. This contribution provides a brief overview of current soil-related issues within the Maltese Islands while the major threats to the islands' soil resources are identified and discussed.

Part II is the section which is concerned with methodological issues in the teaching of geography. This year we have another useful contribution prepared by Rita Debattista which collates presentations and posters presented by Geography teachers at Lorenzo Gafa` Boys' Secondary School, Erin Serracino Inglott Girls' Secondary School, and Guzeppi Despott Boys' Junior Lyceum. The theme is suited to World Food Day and includes topics like Hunger and the geographical factors associated with such problems. A particularly interesting contribution is the inclusion of a simulation game called – Danger from Flooding. This should prove highly enjoyable to most pupils.

Part III contains some interesting material presented by students. This folder contains a set of stimulating PowerPoint presentations and accompanying documents regarding paradigms and epistemologies in Geography. These were delivered by this year's PGCE students and I would like to thank all of these students for consenting to include their work in this DVD.

The last section, Part IV, contains a series of pictures taken during this year's GTA field trips by Patrick Bonnici. Members are always happy to receive copies of such images because they can often see themselves in the picture. The primary objective of our providing such pictures, however, is that they can be utilised for teaching purposes. A digital aerial video of several parts of the Maltese and Gozitan coastline may prove

particularly useful. I would like to thank Patrick for making these photos and video available to all our members.

I would also like to thank all the other contributors to the DVD as well as the editorial board for their work. A special note of appreciation goes to Patrick Bonnici for his tireless efforts in the production of the DVD covers and his generous help with the reproduction of the DVDs.

We would like to remind members, as well as non-members, of the Association that we always welcome articles and papers regarding the content and methodology of geography teaching.

Avertano Role (Chairman Editorial Board)
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Pollen: A Biological Indicator for Climate, Geographical and Soil Conditions

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Abstract
The monitoring of pollen concentrations over time, delivers detailed information on droughts and desertification in the monitored area. The change in pollen concentration of typical plant species for the specific area over time makes it possible to predict its status such as extinction and overpopulation. Therefore risk analysis on the future development of the surrounding ecosystems are possible Such systems include the Mediterranean maquis, vegetation of dunes or wetlands, as well as extrapolations for areas with similar geographical, climate and soil conditions.

Introduction

Pollen is produced in the male organ of flowering plants, trees and shrubs. Pollens are categorized into two classes, although these sometimes overlap. There are the entomophyllous pollens, those that are dispersed by insects and anemophyllous pollens, those that are dispersed by abiotic factors particularly wind. Pollen grains exist in various shapes, sizes, and surface markings characteristic of the species. Most, but certainly not all, are spherical (figure 1a), others winged, while others triangular. Pollen sizes range between 6 and 100 µm. Therefore most pollens are hardly visible by the naked eye. Fungal Spores are produced by a different group of organisms called fungi. These are also observed in airborne particle samples. The smallest fungal spores measure between 3 - 5µm. As discussed later, pollen grains need to be stained in order to be examined and identified. Pollens can be identified from spores as the latter do not take up the stain.
The study of pollen is called palynology and is highly useful in palnoecology and geography, paleontology, archeology, and forensics. The anemophyllous pollens are studied under the area of aerobiology. Aerobiology is a branch of biology that studies organic particles, such as bacteria, fungal spores, very small insects and pollen, which are passively transported by the air (Spieksma, 1991).
However, the techniques used to obtain pollen and fungal spore emission data, are somewhat overlooked. The aim of this review is to briefly describe the methods used to collect, study and interpret pollen grain emissions.

Materials and Methods

The typical instrument used to collect pollen grains and fungal spores, was first designed by Hirst (1952). The two models, available on the market, are 7-day samplers, Burkard volumetric spore trap (figure 1b) and Lanzoni volumetric pollen and particle sampler. The sampler is placed at a strategic position, away from vegetation and about 15-25 m above ground level. The

two samplers installed on the Maltese Islands are situated on Fort San Lucjan (M'Xlokk, figure 1b) and Ta' Giordan Lighthouse (Gozo, figure 1c).
Air is sucked in at a rate of 10l/min through an orifice, by a pump vacuum. The particles present, in the sucked-in air, are impacted on a petroleum jelly-smeared tape and rotates at a rate of 2 mm per hour. When dismounted from the drum (figure 1d), the tape is cut into daily strips (48 mm), stained with a red stain (Carberla dye) and mounted on microscope slides (figure 1e).
Pollen and fungal spore counts measure the amount of airborne biological particles present in air. There are two types of counts, (1) the total counts that give us an indication of the total amount of biological airborne particles collected, and (2) differential pollen and fungal spore counts that give us detailed information of airborne particles present in air, according to the type of plant (species) or group of plants (genus or family). Counts can be made by either taking horizontal counts, hence obtaining an average of the day, or else vertical counts that measure 2 hourly counts. Counts are reported as biological particles per cubic metre of air.
Although reliable pollen and fungal spore counts can be obtained, problem may arise from a particular pollen trap. In fact, these the problems are related to technical problems in the trap, inconsistent sample gathering from the station by personnel and station shutdown when pollen and fungal spore counts fall to very low (unreadable) levels. Another problematic situation would be the air humidity. In dry weather, the number of aerobiological particles increase, while on rainy days, the number of particles decrease due to precipitation. These might affect the general trend of the pollen and/or fungal spore counts, leading to upsurges or drops in the counts at a particular day, and even at a particular time interval.

Figure 1. (a) Pollens of Curpressus and Taraxacum; (b) Pollen Sampler on Fort San Lucjan; (c) Pollen Sampler at Ta' Giordan Lighthouse; (d) Dismounting the drum; (e) Preparation pollen samples on slides

Results

Typical results obtained from pollen counts are illustrated in figure 2. Asa typical example, from the San Lucjan sampler, high counts of *Parieteria* and *Urtica* spp., were observed particularly between March and May 2007.

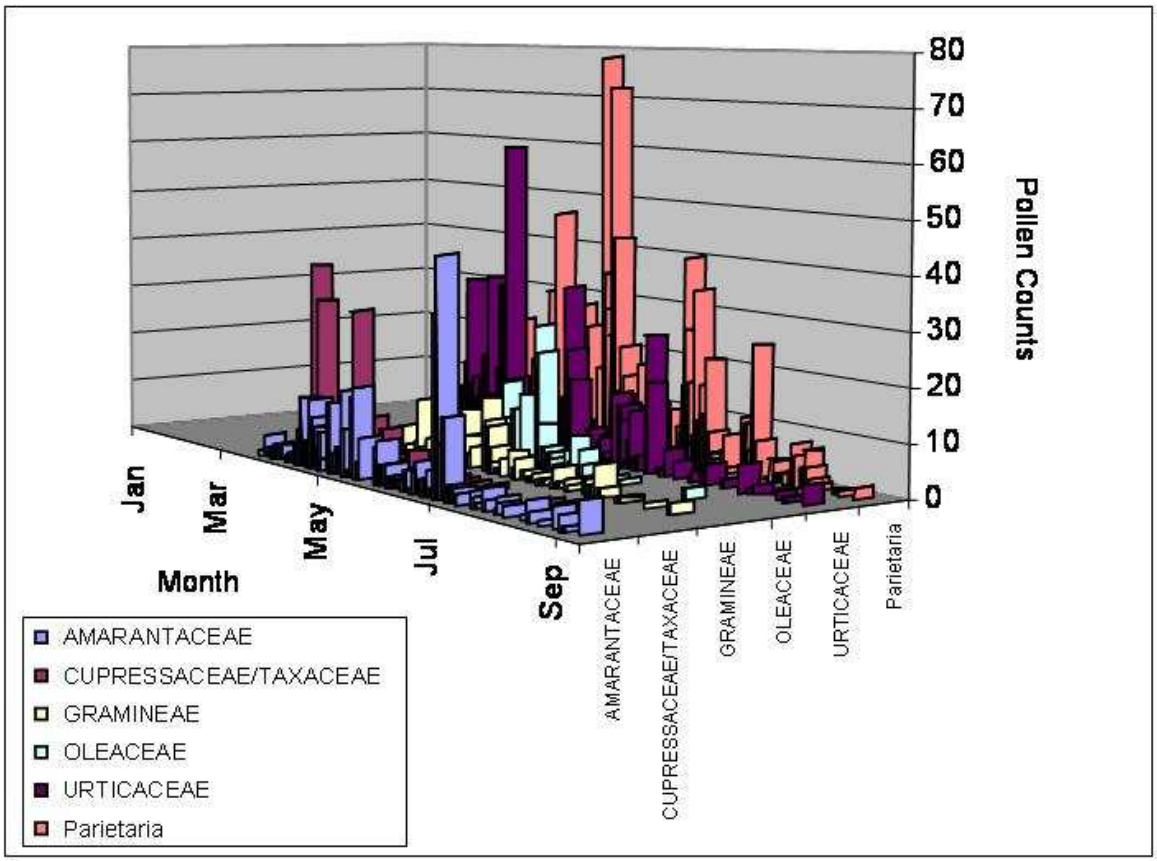

Figure 2. The distribution of air-borne pollens from typical local species between the period of March an September 2007.

Discussion

The original purpose of pollen counting was to forecast the intensity of pollens and fungal spores with time, as a service to patients suffering from respiratory problems (Larsson, 1993). In fact, the Hirst pollen sampler draws in air at a rate of 10 l/min, which is the average respiratory rate of an adult human being. However, data on pollen and fungal spore counts, has been extrapolated to determine climatic changes, especially temperature changes. It is predicted that with time, the Mediterranean region will become much drier leading to the risk of drought and hence desertification. This might have significant consequences on agriculture, forestry, water supplies and tourism. Pollen is a valid bio-indicator for studying effects of drought and desertification due to climate change. An increase in temperature has a direct effect on the modification on flowering time of many herbaceous plants, trees and shrubs. Many scientific works correlate the pollen release in the atmosphere to climatic changes. In Continental Europe, as in the rest of the world, these phenological changes have been proved by airborne pollen monitoring, such

as in the United Kingdom (J.Emberlin, et al., 2002), in The Netherlands (A.J.H. Van Vliet et al. 2002) in Austria (S.Jager et al. 1996) and in Italy (G. Frenguelli et al. 2002.). From these studies, several models have been devised to correlate pollen emissions with climate change, agriculture and respiratory problems.

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