

# HABITAT SIMILARITIES OF COLEOPTERA FROM THE MADEIRAN ARCHIPELAGO

By C. Philip WHEATER<sup>1</sup>

**ABSTRACT.** Site similarities between areas of the Madeiran Archipelago were examined using data from collections of Coleoptera made over an eight year period. The similarities between the major island groups indicated that the Porto Santo sites and the Porto Santo islands were the most similar, followed by the Deserta Islands and then the Madeiran Peninsula. The collections on Madeira proper showed least similarity to those from the other islands. These results were found to be similar to those obtained when data from other workers were analysed.

A more complex pattern of similarities was found when the sites were examined individually. This is probably a result of habitat differences, for example in terms of aspect, altitude and vegetation.

## INTRODUCTION

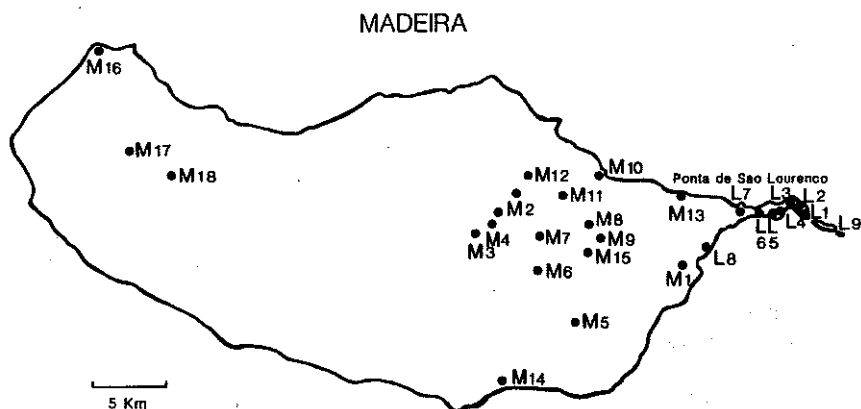
Coleoptera have been collected from several islands in the Madeiran Archipelago from 1981 until 1988 by members of expeditions from the Department of Zoology (later the Department of Environmental Biology) at Manchester University.

The specimens were collected by many different workers and, whilst most were casual collections, some were obtained during the field work for other projects (eg. Delves 1982, Lace 1985, Read & Wheeler 1990).

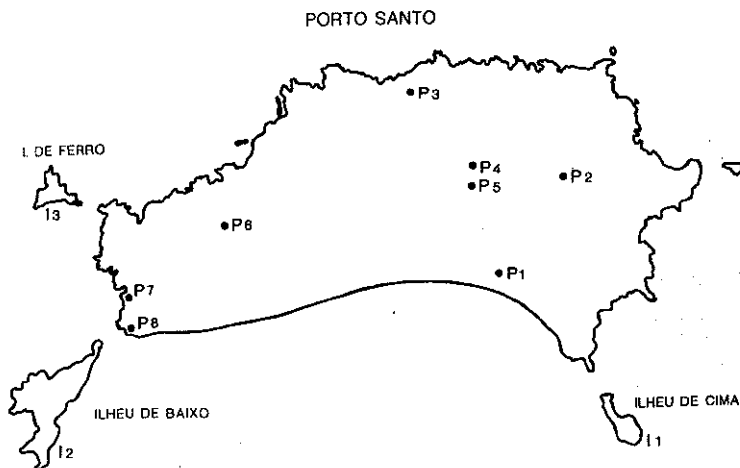
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<sup>1</sup>Department of Environmental and Geographical Sciences, Manchester Metropolitan University, Manchester M1 5GD, UK

The data from these collections have been collated here in order to examine the similarities, or otherwise, of the coleopterous fauna of the archipelago. Comparisons have also been made with two other major collections: a recent contribution by Erber & Hinterseher (1988) and the classical work by Wollaston (1857 and 1871).



**Figure 1.** Sampling sites on Madeira and surrounding islands.



**Figure 2.** Sampling sites on Porto Santo and surrounding islands.

## METHODS

The islands visited and sampled were Madeira, Ilheu de Agostinho, Ilheu de Fora, Ilheu Chao, Deserta Grande, Porto Santo, Ilheu de Cima, Ilheu de Baixo ou da Cal, Ilheu de Ferro (figures 1 and 2). Collections were made at several sites on each of the small islands and at many sites on the two larger islands. For the purposes of this study the data have been combined for each of the small islands, and for the Deserta islands as a group. Some of the samples from Madeira and also from Porto Santo have been combined, only when such a combination was necessary to provide a sample of several species from a locality. The sites combined were of similar vegetation, altitude, etc.. The sites from which collections were made are shown in figures 1 and 2.

Dendrograms have been drawn using a method of cluster analysis described by Cook in 1978. This is the Maximum Likelihood Coefficient which gives values in units of standard error. This technique compares pairs of sites on the basis of the species which are not found in either of the sites, as well as those held in common between sites.

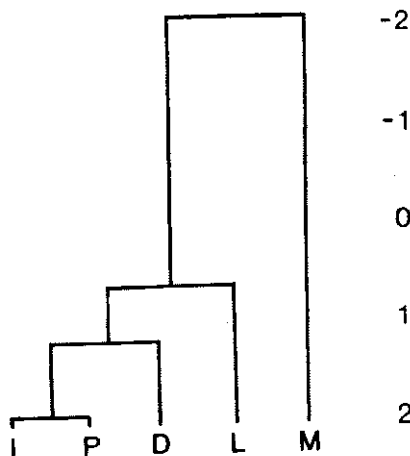
## RESULTS

The results of the comparisons between the major island groups is shown in the dendrogram in figure 3. Comparable results from other workers data are shown in figures 4 and 5. The dendrogram in figure 6 shows the similarities between the collections from each individual site.

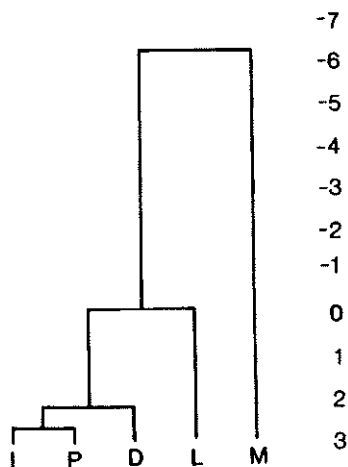
## DISCUSSION

The results from the similarities between Coleoptera from the major islands (figure 3) shows that the Porto Santo islands and Porto Santo itself have the greatest similarity. The next most similar sites are the Deserta islands, then the peninsula of Madeira, followed by Madeira proper. The close similarity between the Porto Santo islands and Porto Santo is perhaps not surprising given the close proximity of the islands to each other and the similarities in habitat type (fairly bare with low growing vegetation over much of the sampling sites). The Desertas and the peninsula of Madeira have similar vegetation types to these and this may go some way to explaining the similarities found here. Madeira proper has a great many other habitat types due in part to the altitudinal range, and the island's larger area. This provides habitats for a larger number of species, and reduces the similarities between this island and the others examined. Similar results were reported for the mollusc fauna by Cook

*et al* (1972) and Cook 1984, with the Deserta Island being more similar to the Peninsula than either were to Madeira proper.

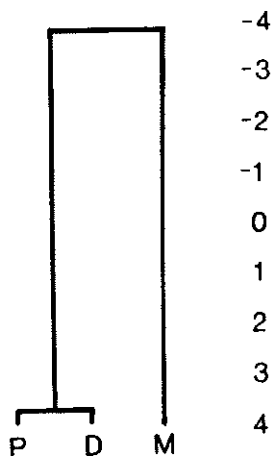


**Figure 3.** Dendrogram of locality similarity using maximum likelihood coefficients based on the coleopterous fauna (data from Manchester expeditions); I=Porto Santo Islands, P=Porto Santo, D=Deserta Islands, L=Madeiran peninsula and islands, M=Madeira.



**Figure 4.** As figure 3, but using data from Erber & Hinterseher, 1988.

From the dendrograms (figures 3-5) it can be seen that the results from the Manchester expeditions agree with those calculated using data from the works by Erber & Hinterseher (1988) and Wollaston (1857, 1871). Note that due to the nature of the latter work only limited information could be gathered and some of the islands have been grouped together. Therefore, similarities were only calculated for Porto Santo, the Deserta Islands and Madeira.

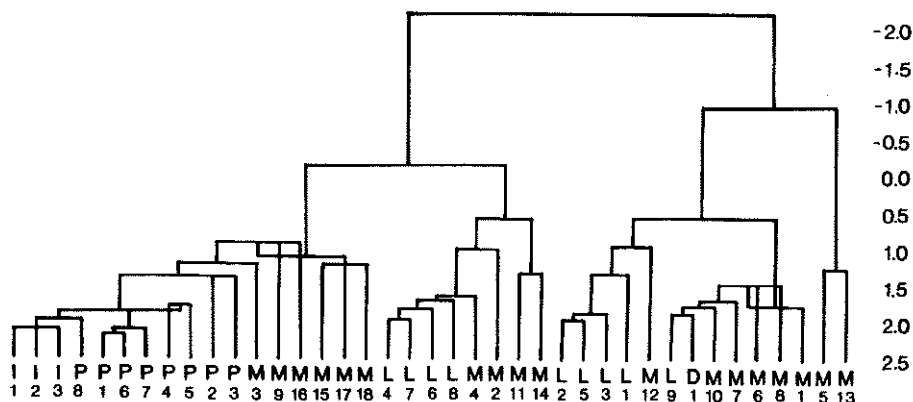


**Figure 5.** As figure 3, but with data from Wollaston 1857, 1871.

When the data collected during the Manchester expeditions were examined in more detail by calculating the similarities between individual sampling sites (figure 6) it can be seen that the sites divide into two main groups which themselves split into five subgroups. Group A contains all of the Porto Santo Island and Porto Santo sites, together with a high altitude site from Madeira (Pico Arieiro) and several sites from the west of Madeira. Group B contains those sites which lie on the southern coast of the Madeiran peninsula together with a small cluster of sites in the Faja da Nogueira/ Achada do Teixeira area and a collection from Funchal. Group C contains the remaining peninsula sites and a collection from Queimadas. Group D contains collections from the islands at the end of the peninsula, the Deserta Islands and several sites in eastern Madeira. Group E contains just two sites from eastern Madeira.

Although this dendrogram shows similar relationships to the previous analyses (figure 3) as far as the Porto Santo Islands and Porto Santo are concerned, the relationships between the peninsula, the Deserta Islands and

Madeira are less clear. It may be that the presence (or absence) of certain ubiquitous species have a greater influence when smaller sites are examined. Even here some relationships may be identified: the peninsula sites seem to separate into those sites on the southern coast and those at the end of the peninsula; the island sites at the end of the peninsula and the sites on the Deserta Islands are most similar; the Madeiran sites seem to split into three main groups based on their locality (sites on the west, sites in the north and centre and sites in the east and south). Altitudinal and vegetational differences between the sites may help to explain other differences. These are still being examined and will be reported later.



**Figure 6.** Similarity of sites within each locality, using Manchester Expedition data.

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**LIST OF COLEOPTERA SAMPLING SITES AT EACH LOCALITY**

(I= Porto Santo Islands, P=Porto Santo, D=Deserta Islands, L=Madeiran Peninsula and Islands, M=Madeira)

- I1 Ilheu de Cima
- I2 Ilheu de Baixo
- I3 Ilheu de Ferro

- P1 Portela
- P2 Serra de Dentro
- P3 Fonte de Areia
- P4 Pico do Castelo
- P5 Terra Larga
- P6 Marinhas
- P7 Cabeco do Zimbralinho
- P8 Ponta da Calheta

- D1 Deserta islands

- L1 Ponta do Furado
- L2 Casa da Sardinha
- L3 Ponta do Castelo
- L4 Ponta do Buraco
- L5 Ponta das Gaivotas
- L6 Prainha
- L7 Cabeco da Cancela
- L8 Rocha da Faja
- L9 Ilheu de Agostinho and Ilheu de Fora

- M1 Machico
- M2 Achada do Teixeira
- M3 Areeiro
- M4 Faja da Nogueira
- M5 Vale de Paraíso
- M6 Poiso
- M7 Ribeiro Frio
- M8 Lamaceiros
- M9 Santo da Serra
- M10 Porto da Cruz
- M11 Ribeiro da Ametade
- M12 Casa das Queimadas
- M13 Boca do Risco
- M14 Funchal
- M15 Cabeco do Curral
- M16 Santa Madalena
- M17 Fonte do Bispo
- M18 Paul da Serra