Giovanni Lo Bue

Recording and mapping of fungi in Italy

Abstract

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Recent activities and prospects in the field of assembling and managing data on Italian macrofungi are reviewed. A project for recording and mapping fungi is being promoted by the mycology working group of the Italian Botanical Society, in conjunction with two amateur societies already active in the field (Associazione Micologica "Bresadola" and Unione Micologica Italiana). To date, a chorological survey of the Alto Adige region is nearly completed, and mycological data bank for the Piedmont region exists that is part of a wider system of regional naturalistic data banks and provides for both chorological and ecological surveys. It is planned to extend the coverage of these regional surveys countrywide, starting with the preliminary test mapping of 400 selected species.

A project promoted by the mycology working group of the Italian Botanical Society (SBI) aims at recording and mapping Italian fungi. The participation of amateur mycologists is indispensable for this purpose. Indeed, their two leading Italian organizations – the Unione Micologica Italiana (UMI) and the Associazione Micologica Bresadola (AMB) – have long started the mapping of macrofungi on their own account. In 1979, Govi began collecting data on the distribution of 100 species throughout Italy, on behalf of the UMI, and has so far brought together about 25 topographical and habitat files for each species. Before being completed, this work still requires data from some regions of southern Italy.

The Bolzano section of the AMB has now been engaged for over ten years in an extensive census of the macromycete flora of the Alto Adige region, along the lines of what is done in Central Europe by the German Mycological Society. The mapping grid units coincide with the 1 : 25,000 maps prepared by the Italian Institute for Military Geography. In addition, since the Alto Adige is a mountainous region, ten altitudinal belts of 300 metres each have been defined for the purpose of vertical mapping (Bellù 1992).

The area is covered by 116 maps, of which 97 have already been subjected to census. By the end of 1991, 16,519 field observations had been recorded, 1781 species had been identified, and 941 vouchers had been collected (Chissalé & Cipollone 1983, Bellù, unpubl., Bellù & al. 1991). Four mycologists form the mapping committee proper, an-

other four take part in species determination and data processing, and some 50 members of the section collect the fungi. Computerization started in 1988 (Macchi, unpubl.), and results have already been presented at international congresses.

The most recent events concerned with promoting the mapping of fungi in Italy have been:

- Turin, February 1992: seminar on the recording and mapping of macromycetes.
- Arzana (Sardinia), November 1992: regional mycology meeting.
- Florence, April 1992: meeting on "Conservation of fungi in Italy: red-lists and mapping", organized by the SBI mycology working group.

At the Turin seminar, the Dutch and Swiss mycological data banks were studied for comparison. The software of the Piedmontese Mycological Data Bank (PMDB) was also presented (Macchi, unpubl.), and illustrated by an example of its application (Lo Bue & Fella 1994). The seminar showed that fungus recording programmes are designed to collect either chorological or ecological information.

The substantial differences between these two approaches were emphasized at the Arzana meeting by means of a comparison between several European data banks (Lo Bue 1994). Chorological data banks use mapping grids with meshes of the order of magnitude of 100 km^2. When a grid mesh is surveyed, all fungi are recorded together on a single card, leaving no room for ecological data on, e.g., vegetation, altitude, slope, chemical and physical properties of the soil. At the scale used, reference can be made to climate, pluviometric, geological and pedological maps. Chorological mapping at a smaller scale would not be practicable. Italy's 321,700 km^2 correspond to 3,545 sheets of the 1 : 25,000 map. With a fungal flora of 5,000 species, the presently used grid already results in a total of 17,725,000 presence-absence data requiring regular updating.

The enormous number of data is the limiting factor for a chorological approach, and therefore the attention is usually focused on a few well-defined species: 400 in the Dutch Atlas project, 118 in the French mycological inventory proposed by Courtecuisse (1991). Krieglsteiner (1991), however, has mapped the distribution of 2,193 species in Germany.

Ecological surveys must use a much finer grid and be compatible with other naturalistic data banks. The ecological and chorological approaches differ, not only in the accuracy of record location but also in that the former implies an in-depth description of the habitat. The quantity of environmental data to be gathered is the limiting factor of the ecological approach. It is therefore necessary to operate through sample areas, as does the programme adopted by the Swiss Mycological Society, which provides for ten standard survey areas of 100 m^2 each per 100 km^2 map unit; out of which four are chosen at random and six in predefined types of habitat. Switzerland's 42,000 km^2 are covered by a grid with some 420 meshes. Leaving aside built areas, lakes and summital zones above the limit of herbaceous vegetation, the project must still provides for the periodical checking of more than 1,000 standard surveys (Senn-Irlet, unpubl.). This pattern would be difficult to follow in Italy, which is nearly eight times the size of Switzerland and has a wider variety of habitats.

As Arnolds (unpubl.) stated during the Turin seminar, certain fundamental conditions must however be satisfied irrespective of the approach chosen:

- co-operation between field mycologists, both amateurs and professionals;
- existence of a central, stable organization;
- a uniform geographical grid system;
- agreement on nomenclature and taxonomic concepts (Arnolds & al. 1984, 1988);
- automatic data processing facilities;
- a uniform format for entering the data (Arnolds & Jansen 1991).

The Florence meeting, attended by mycologists of all categories and taking into account the above considerations, had as its main objective to agree on the launching of an "Italian Programme of Recording and Mapping of Fungi" and to propose a provisional red-data list of fungi (which has meanwhile been prepared).

The difficulty of designing a single recording card for use in both chorological and ecological surveys is obvious. It was therefore decided to use separate cards for these two types of survey.

A chorological survey limited to 25 species will serve to test the functionality and efficiency of the national mapping project. The chorological recording card employed in this test has the following data fields: date, observer's code, locality, municipality, province, region, "aspect", soil type, map sheet, habitat, altitudinal belt, and list of recorded species, each with indication of substrate, slide number, identifier's name, and herbarium number. The basic mapping units are the 636 sheets of the 1 : 50,000 maps of the Italian Institute for Military Geography, each of which covers an area of about 26 × 22 km (20' longitude by 12' latitude). A simple notation has been devised to refer to submeshes of quarters, eighths or sixteenths of a sheet.

The synecological recording card makes provision for more detailed habitat data and a more precise location reference. The data collected in this type of survey must be suitable for use in the national mapping project. Each macrofungal record must be accompanied by a full analysis of the vegetation.

An Italian Mycological Data Bank will be created, which in effect extends the PMDB to the whole territory of Italy. The PMDB, created for Piedmont by Macchi (unpubl.) at the National Research Council's Soil Mycology Centre in Turin, makes provision for the filing of synecological, mycofloristic and bibliographical data for use in both ecological and chorological investigations. Its software is compatible with that used by the Regional Naturalistic Information System (RNIS) to ensure full transferability of data. The RNIS comprises several data banks relating to flora and vegetation, mammal, fish and bird fauna, wetland and cave habitats. Its data filing and processing tools are linked to the Cartographic Information System, allowing direct preparation of thematic maps and the use of data for the Environmental Territorial Information System (ETIS). RNIS and ETIS, in turn, are integral parts of the Environmental Naturalistic Information System (ENIS), which pools and co-ordinates the regional environmental data collection and processing systems. ENIS is funded by the Italian Ministry of the Environment.

The PMDB, therefore, has been designed primarily for the purpose of synecological studies but is also a suitable instrument for autecological, chorological and floristic investigations. It is composed of four interrelated files (Fig. 1):

- fungus species;
- synecological records;
- mycological collections in the synecological records;
- one-fungus mycological collections.

Universal Transverse Mercator (UTM) map references (1 × 1 km grid meshes) are used. The vegetation is coded as in the Flora and Vegetation Data Bank (De Biaggi & al., unpubl.). The following procedures are provided for:

- data filing (insertion of data is mandatory for some fields, optional for all others);
- interrogation for records (by single key, by a combination of keys, by presence of species, or by manual selection);
- interrogation for species or collections (by single key or by a combination of keys);
- data amendment and deletion;
- printing or display of selected collections or species data, in full or in tabular form;
- data output as formatted files(in ASCII format, DBASE format, or sequential file format for processing with the LAGOLI multivariate analysis package (Lagonegro & Feoli 1984);
- other user facilities (indexing, printing of dictionary or codes, downloading on diskettes, input from diskettes, file merging).

The PMDB structure is set out in Fig. 2, where the fields that the four files have in common are readily visible. As in other RNIS banks, it is possible to switch automatically between the aspects "data" and "index" (Lo Bue & al. 1994). PMDB has a special thesaurus for each of the following data fields:

- environment;
- growth substrate;
- vegetal matrix (Pignatti 1982);
- geographical zone (Montacchini 1976);
- park or reserve (De Biaggi & al., unpubl.).

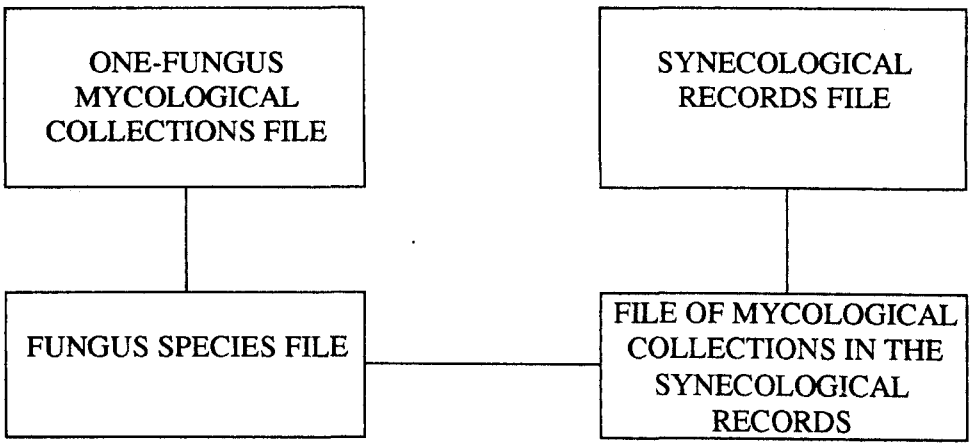

Fig. 1. The four data files of the Piedmontese Mycological Data Bank and their connections.

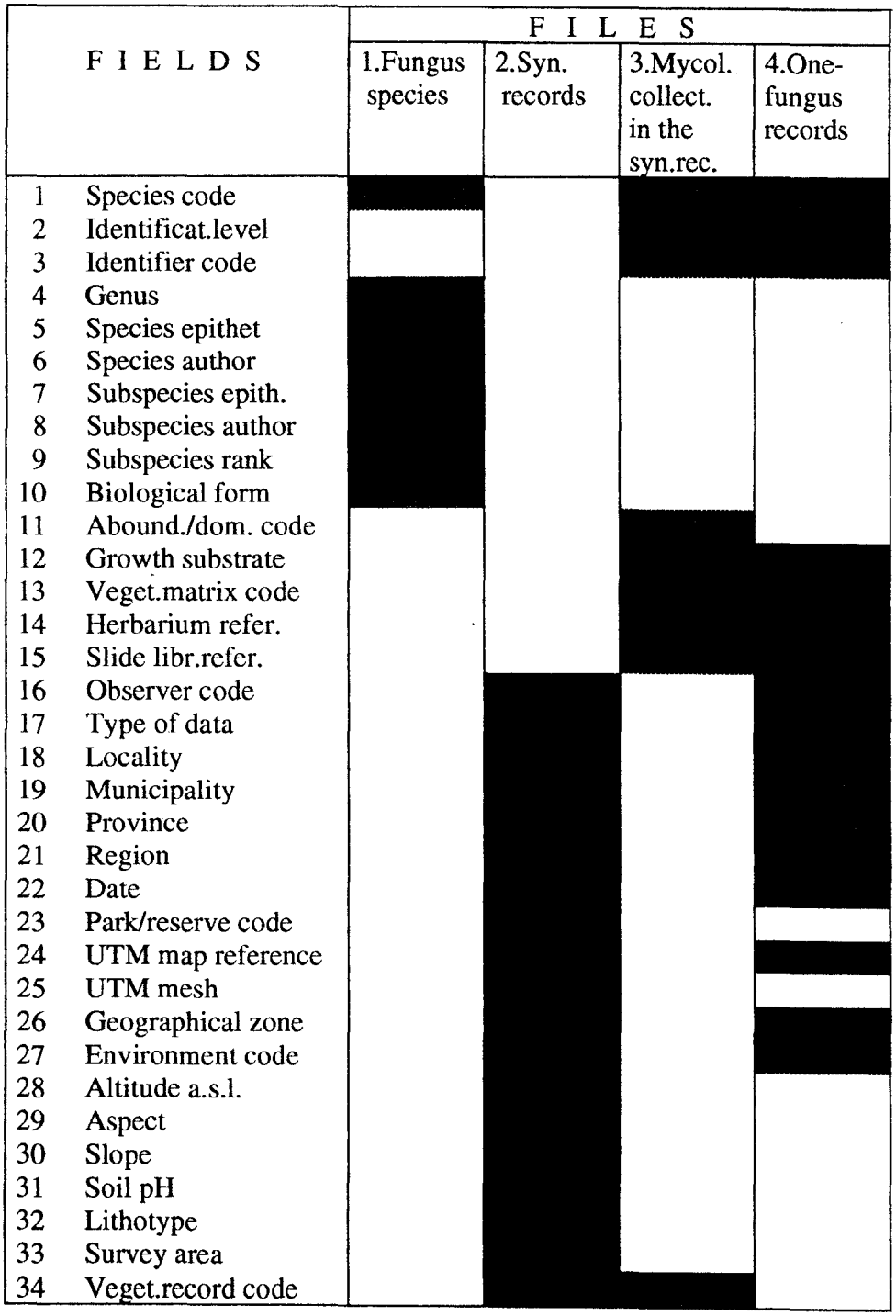

Fig. 2. The data fields (in black) in the four data files of the Piedmontese Mycological Data Bank.

The PMDB can interact with the other ETIS data banks, especially the Flora and Vegetation Data Bank, or it can operate independently as a file for mycological data taken from synecological surveys, or for single-species collections and observations. Since its locality data are linked to the UTM system, it is easy to extend it beyond the regional level with but minor modifications.

If the results of the preliminary national mapping test are satisfactory, a larger number of fungus species will be mapped. The present intention is to prepare a distribution atlas for about 400 species (Onofri 1994) as well as regional check-lists from which a national one can be compiled. At present such a check-list is only available for Sicily (Venturella 1991). Voucher specimens will be preserved in the Herbarium Mediterraneum Panormitanum (PAL).

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Address of the author:
Dr Giovanni Lo Bue, Centro di Studio sulla Micologia del Terreno, C.N.R., Viale P. A. Mattioli 25, I-10125 Torino, Italy.