# THE FRENCH INFORMATION SYSTEM ON SAPROXYLIC BEETLE ECOLOGY (FRISBEE): AN ECOLOGICAL AND TAXONOMICAL DATABASE TO HELP WITH THE ASSESSMENT OF FOREST CONSERVATION STATUS

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Résumé. — *La base de données sur l'écologie des coléoptères saproxyliques (FRISBEE): un outil taxinomique et écologique pour l'évaluation de l'état de conservation des forêts.* — La base de données sur l'écologie des Coléoptères saproxyliques français (FRench Information system on Saproxylic BEetle Ecology, FRISBEE) a pour objectif la compilation organisée de l'information écologique disponible pour toutes les espèces de Coléoptères associées au bois mort ou dépérissant, ou aux micro-habitats connexes. Cette base de données met en relation 4 tables: (i) une table bibliographique, (ii) une table taxinomique, dotée d'une référentiel taxinomique des espèces avec leur valeur patrimoniale, (iii) une table écologique, incluant 11 descripteurs du bois ou traits écologiques caractérisant l'association des insectes aux attributs ligneux, (iv) et une table photographique. La base FRISBEE constitue un outil pragmatique pour l'évaluation de l'état de conservation des forêts ou pour l'analyse fonctionnelle des assemblages d'espèces.

*Mots-clés*: Autécologie, statut de conservation, gestion forestière.

Summary. — The FRench Information system on Saproxylic BEetle Ecology (FRISBEE) is aimed at organizing species-specific ecological information for all wood-associated beetle species in France. Four tables are linked in a relational database structure: (i) the reference table, (ii) the taxonomical table, containing information with standardized nomenclature and species patrimonial value, (iii) the ecological table, including 11 wood parameters or ecological traits that categorize the association of a species to different wood attributes, (iv) and the photographic table. The FRISBEE database is meant to serve as a pragmatic tool for assessing the conservation status of forests and for carrying out functional analyses of saproxylic beetle assemblages.

*Keywords*: Autecology, conservation status, forest management

## CONTEXT

As soon as 1988, the Council of Europe encouraged European governments to use the saproxylic organisms in the evaluation of forest conservation status: "The Committee of Ministers, under the terms of Article 15.b of the Statute of the Council of Europe, […] recommends

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that the governments of member states: […] consider the desirability of making a survey of saproxylic organisms when assessing the quality of forests for nature conservation purposes, particularly where the intention is to re-establish natural forest conditions within a protected area" (Recommendations R(88)10 and 11 on the protection of saproxylic organisms and their biotopes). Nevertheless, about twenty years later, only a few tools are available to satisfy this objective.

Since saproxylic biodiversity is very high in European forests, it is a challenge to monitor dead-wood associated organisms. About 25% of forest species are saproxylic organisms in Scandinavia (Stokland *et al.*, 2004), and 20% of the forest fauna is related to dead wood in Great-Britain (Elton, 1966 *in* Dajoz, 1998). Just after the fungi (30% of the saproxylic organisms), beetles are dominant in saproxylic assemblages (20% of the saproxylic organisms; Stokland & Meyke, 2008). Furthermore, 20% of national beetle species are saproxylic in Germany (Köhler, 2000) and Finland (Berg *et al.*, 1994). Among national forest beetles, saproxylic beetles represent 40% (Finland, Martikainen, 2003) to 56% of species (Germany, Köhler, 2000). This high biodiversity is threatened, since 20% (Finland, Berg *et al*. 1994) to 35% (Germany, Köhler, 2000) of saproxylic beetles are currently red-listed. At least 2% of the national fauna was driven to extinction, from 1800 in Finland (Martikainen, 2003) or from 2900BC in Great-Britain (Buckland & Dinnin, 1993).

Information systems focusing on the species-rich group of saproxylic beetles has been developed in several European countries (Scandinavia: Dahlberg & Stokland, 2004; Great-Britain: Alexander, 2002; Germany: Köhler, 2000, Schmidl & Bussler, 2004, Müller *et al.*, 2005).

In France, the saproxylic beetle fauna is only partly covered by these databases. The first French project was a list of 300 species written by Brustel (2004) as a pragmatic conservation tool. This pioneer initiative now suffers from a poor representativeness (i) in a taxonomical point of view (only 15% of the species and 40% of the families are represented), and (ii) in an ecological perspective (only mid-size, large and remarkable species were included).

## STRUCTURE

The FRench Information system on Saproxylic BEetle Ecology (FRISBEE) has the ambitious aim to organize species-specific ecological information for all wood-inhabiting beetle species in France. The current project aims at building a national and homogeneous information system on ecology, but not on geographical distribution. The FRISBEE database does not include other insect groups (e.g. Diptera, Hymenoptera, Hemiptera and Lepidoptera), nor other invertebrate groups (e.g. mites and pseudoscorpions).

Three steps have been planned and are still in progress:

1 - to make a complete taxonomical table of saproxylic beetle French fauna, based on a corrected update of the Fauna Europaea (ca 2500 species, 71 families including Staphylinidae, Buprestidae, Anobiidae, Cerambycidae, Curculionidae (Scolytinae), Tenebrionidae, etc.);

2 - to compile the available autecological data in predefined variables for each species (larval trophic regime, larval micro-habitat, relation to flowers, tree species preference, etc.);

3 - to attribute a patrimonial value to each species (in agreement with the approach of Alexander, 1988 and Brustel, 2004).

Like in other databases dealing with flora (LEDA (Knevel *et al*., 2003), Theophrastus (Weiher *et al.*, 1999), BiolFlor (Kuhn *et al*., 2004)) or insects (hoverflies, i.e. Diptera Syrphidae, Speight *et al.*, 2005), the data is organized as records in several tables being linked in a relational database structure. Each record has a reference to the information source.

Figure 1 shows the FRISBEE tables with their fields and the connections between them.

Four main tables were defined:

— the reference table, compiling the different sources of information (books, journal articles, reports, conference papers, electronic sources, theses, etc.);

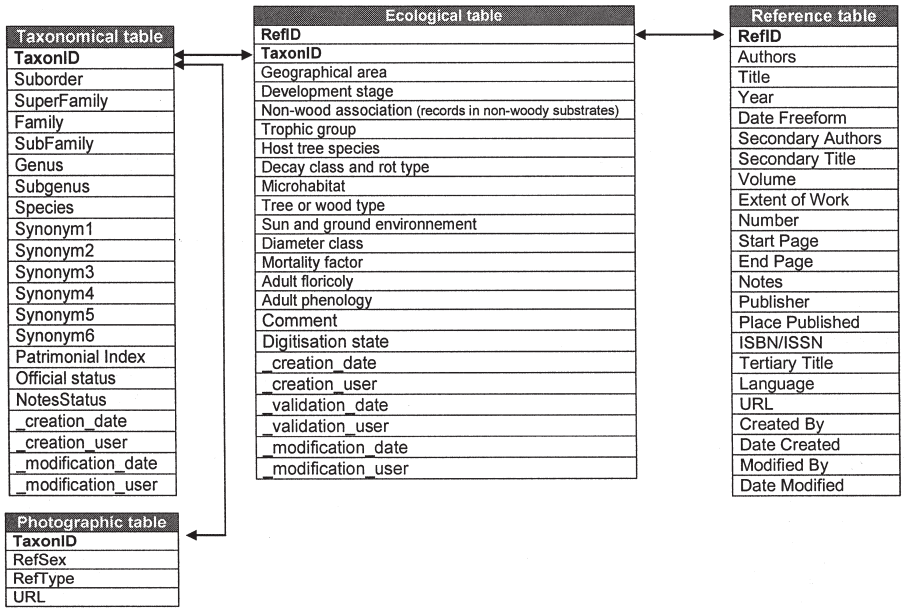


Figure 1. — Structure diagram of the relational database FRISBEE. Tables, fields and connections between them.

— the taxonomical table, containing information with standardized nomenclature, national and international status, and patrimonial value;

— the ecological table, including 11 wood parameters or ecological traits that categorize the association of a species to different wood attributes. In order to exchange information with the Nordic database, the Nordic ecological fields were retained in the FRISBEE database. Nonetheless, 5 fields were adapted to the entomological FRISBEE context: non-wood association (records in non-woody substrates), trophic group, microhabitat, tree or wood type, mortality factor. Moreover, 2 fields were added: adult floricoly and adult phenology.

— the photographic table, i.e. a picture library portraying adults, larvae or traces of beetles.

The process of digitizing data, under the framework of some useful guidelines, was divided into steps, from the compilation of primary bibliographic information in a table of raw data to the coding of synthetic tables by expert filters.

As the saproxylic database is developed in cooperation between several people, it will be available online to facilitate the multi-site digitizing tasks. The online version is currently programmed by data processing specialists at the French Forest National Inventory (IFN). Data will be managed using MySQL, and the FRISBEE application developed in PHP5.

## AIMS

The FRISBEE database mainly aims at (i) assessing and comparing the conservation status of stands, forests or reserves, by cumulating the species patrimonial indices of saproxylic beetle assemblages sampled in standardized conditions, and (ii) carrying out functional analyses of the relationship between local dead wood profiles and ecological groups defined on the basis of autecological variables.

## ACKNOWLEDGEMENTS

We would like to thank the French National Forest Inventory (IFN) for helping to define the structure and programming the FRISBEE database.

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