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BRIS: A COMPUTER BASED BIRD REMAINS IDENTIFICATION SYSTEM. FURTHER DEVELOPMENTS.

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Summary

A user-friendly computer information and identification system for bird remains (BRIS) is being developed by the European Centre for the Identification of Bird Remains (Zoological Museum, University of Amsterdam), the Expert Center for Taxonomic Identification (ETI) and the Tel Aviv University. The BRIS, based on ETI's Linnaeus II software, consists of various parts. A multimedia database stores detailed textual and pictorial information on feather structures. An innovative computer-guided identification system assists the user to recognize the identification characters and to identify the taxa. An interactive geographic information system allows for quick geographic searches through the data. Also general information on bird species, such as descriptions, diagnostics, colour pictures, distribution maps etc. is included. BRIS now covers 200 European species and will be released on CD-ROM in 1996. International cooperation is sought to expand the system with more species and further information. We actively solicit comments, suggestions and input from ornithologists and others who are working on the identification of bird remains. We propose an international network of specialists to expand the BRIS. In this paper the methods of identification and the implementation of the geographic information system are discussed.

BRIS: a computer based Bird Remains Identification System. Further developments.

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Abstract. A user-friendly computer information and identification system for bird remains (BRIS) is being developed by the European Centre for the Identification of Bird Remains (Zoological Museum; University of Amsterdam), the Expert Center for Taxonomic Identification (ETI) and the Tel Aviv University. The BRIS, based on ETI's Linnaeus II software, consists of various parts. A multimedia database stores detailed textual and pictorial information on feather structures. An innovative computer-guided identification system assists the user to recognize the identification characters and to identify the taxa. An interactive geographic information system allows for quick geographic searches through the data. Also general information on bird species, such as descriptions, diagnostics, colour pictures, distribution maps etc. is included. BRIS now covers 200 European species and will be released on CD-ROM in 1996. International cooperation is sought to expand the system with more species and further information. We actively solicit comments, suggestions and input from ornithologists and others who are working on the identification of bird remains. We propose an international network of specialists to expand the BRIS. In this paper the methods of identification and the implementation of the geographic information system are discussed.

Introduction

Reliable identification of bird remains is of vital importance for flight safety statistics. Bird collisions are hazardous, costing many millions of dollars world-wide. Also in other fields like archaeology, criminology, studies on food consumption of carnivores, and in enforcement of nature protection laws, identification of bird remains is conditional. In all these cases remains of birds, sometimes very small, need to be identified. Identification of pieces of feather, skin, and blood requires special expertise. Once the species name is known, information on migration routes, cruising height, flocking, foodweb relation etc. can be obtained from the literature, compulsory to avoid further collisions.

Presently identification of feather remains depends on skilled and experienced scientists with access to a large collection of microscopic slides for comparison, since this information is not readily available in the literature. Feather characters need visual recognition, which is extremely difficult to describe in text. The complicated process of identification based on feather microstructures is not very well suited for dichotomous keys. New approaches with the help of computer technology are supportive to document the experts view. Also reproduction of thousands of photographs of microscopic details of various feather structures in a traditional way is not feasible, while publication in digital form reduces publishing costs considerably. ETI's multimedia Linnaeus II software (fig. 1) offers new opportunities to taxonomists to produce completely illustrated keys based on feather characteristics supported by an extensive image library, a database with descriptions and references, and a geographic information system for distribution information.

Developments

The European Centre for the Identification of Bird Remains at the Zoological Museum in Amsterdam offers for many years expertise for various parties. A long standing cooperation with the Royal Netherlands Airforce (RNLAF) was mutually beneficial, both for improving identifications as for devising measures to prevent damage.

In 1994, this centre and ETI started a project to build a computer based Bird Remains Identification System

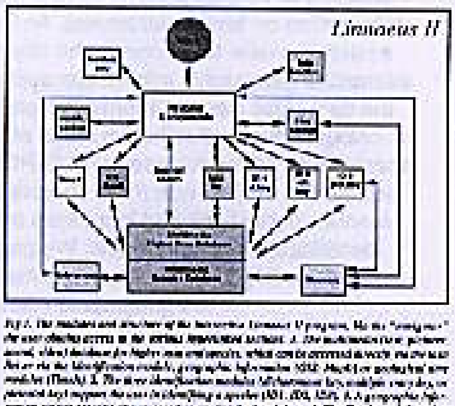
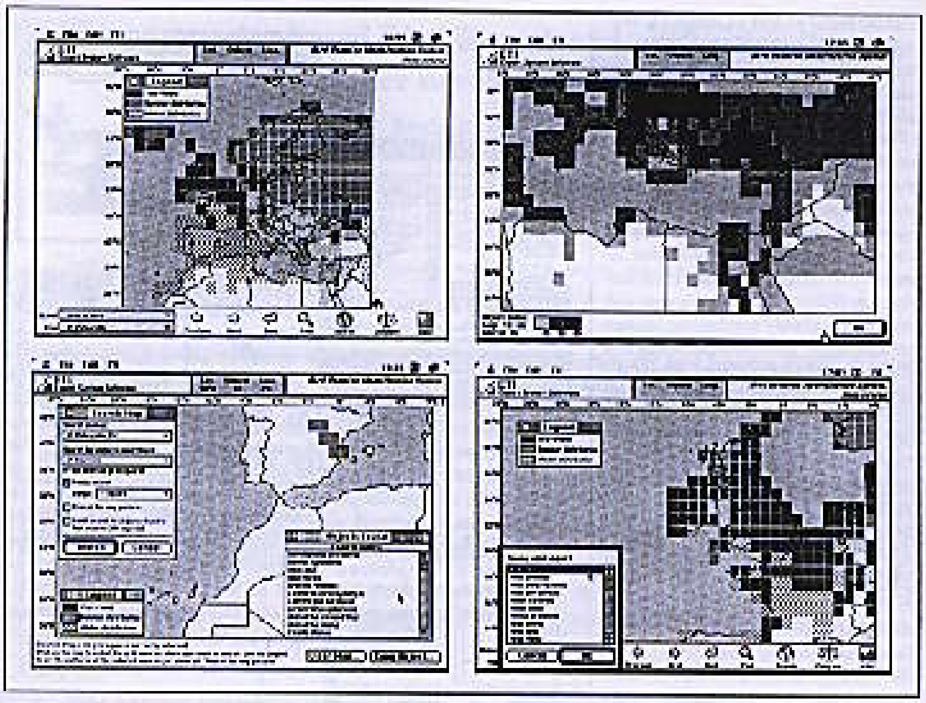


Fig. 1. The modules and structure of the interactive Linnaeus II program. [illegible]



from the vase-shaped nodes of waders, characters which are hard to observe in dry slides. On the other hand, preparation of dry slides is less complicated under field conditions and unpigmented structures like villi and short prongs are easier to discern. In the methods section of the BRIS CD-ROM, special attention is given to these methods and their application.

The standardised identification system in BRIS is based on a matrix, including all the characters examined. The character states define as many states as possible to improve the 'resolution' of the identification process. The matrix includes both descriptive information and measurements.

The quantitative characters are approached by subdivision of character states into intervals. A species is placed into its specific interval by selecting at random from five test samples. Measurements are from the basal parts of barbs. The descriptive characters define node and internode shape, node and prong distribution, and pigmentation. Standardising the two datasets induced clarification of the feather descriptions for all species examined. Though characters may overlap between different character groups, the unique combination of the characters will lead to identification: the more characters are defined, the lower the taxonomic group that can be identified.

The expansion to 57 families with 200 species required the establishment of new characters and character states. Finally, a single identification key was created for all 200 species. Now in total 47 character states spread over 11 characters are used for identification (table 1)

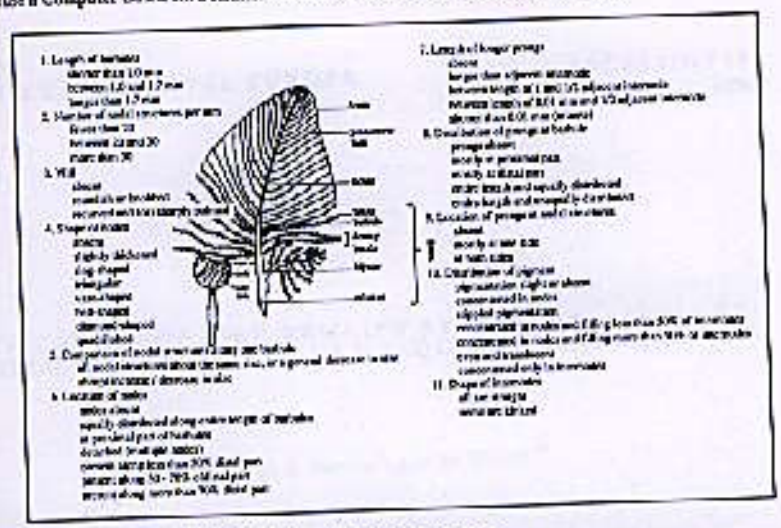
Fig. 3. The [illegible] distribution maps of 200 bird species. [illegible]

Interactive geographic information

Apart from microscopic identification, an important tool in the identification process is the geographical position where the actual strike occurred. A known location may reduce the number of bird species theoretically involved. ETI developed an interactive geographic information system for the Linnaeus II software named MapIt, for storing distribution data of each species (Fig.3). MapIt displays distribution patterns of the 200 species, with for each species the general distribution in the western palearctic region, or in one of the six underlying maps, that show different parts of the western palearctic region in detail. MapIt can support the process of bird identification by providing a list of species in a particular bird strike area selected by the user. This way the number of possible suspects may be reduced. Another option is to compare areas by estimating for each area the number of species occurring in that area. We intend, in a later phase, to further improve the bird distribution data with details per season or even per month, including, for migratory birds, migration routes and cruising height.

An international network of specialists

One of the first steps in solving the problem of collisions between birds and aircraft is establishing which bird spe-



cies are the most accident prone' (Brom 1986). Using both microscopic and macroscopic methods to identify feather remains, a majority of the material can be assigned to species (Shamoun and Yom-Tov 1994), thus affecting bird strike statistics (Buurma and Brom 1979) and considerably increasing the quality and value of bird strike reports (Buurma 1984; Buurma and Dekker 1990). Reliable birdstrike statistics can only be integrated and evaluated when all feather remains are identified with standardised methods (Brom 1991). These data will lead to a better insight in bird behaviour, including flight tracks and periods of bird activity. This all will promote better preventive measures. Standardisation of methods will also improve proper identification of bird remains (Brom and Wastl 1990). BIRIS will offer an excellent opportunity to distribute standardised identification keys, as well as a feather image library. Also, it offers the possibility to combine available expertise in one single system, and to distribute it to users world-wide at reasonable costs. The European Centre for the Identification of Bird Remains together with the Tel Aviv University and ETI will release the BIRIS CD-ROM in a package which includes an option for users to enter a contract with the centre for further expertise and support.

BIRIS is constructed in an "open" way, it may be expanded with more species and to other types of information, like other feather parts, macroscopical feather characters, skeletons skulls, geographical or ecological information and migration routes. Expanding the list of identification characters or states is not restricted. The combination of different data sets will further enhance the system and its usefulness. Building such a highly specialised system is a job of specialists and should be based upon international cooperation and data exchange. We solicit other experts to join an international network for collaboration to cover more taxa and areas.

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