

WHITE, I. M., AND D. L. HANCOCK. 1997. Indo-Australasian Dacini Fruit Flies. (Computer Aided Biological Identification Key). International Institute of Entomology, London. ISBN 0-85199-171-0. Compact diskette. \$320.00 (for single user).

Among the tephritid fruit flies, the Dacini comprise one of the largest and most taxonomically challenging groups. Here Dacini refer largely to the genera *Bactrocera* and *Dacus*, which include many important tropical and subtropical fruit and vegetable pests, such as the Oriental, melon, and Queensland fruit flies. Accurate identification is a problem, especially when keys are written for females, but interceptions and surveys are usually of males taken in pheromone traps.

This CD-ROM conveniently brings together in one place an enormous amount of information on the dacines. It includes four programs: Key to the Dacini of the Indo-Australasian region, which forms the heart of the offering; CABIKEY Help with details on system requirements, general workings and capabilities of the software, and a simulated identification session; Dacini Help with a glossary of about 200 terms covering fruit fly morphology plus a few nomenclatural and ecological terms; and an Un-install utility. Recommended computer system specifications include Windows 3.1x or Windows 95 operating system, 8 MB of RAM (16 is ideal, 4 is adequate), and display of 256 colors or more. The installation proceeded quickly and seamlessly on my Dell® 486 running Windows 95 and its files consumed 1.32 MB of hard disk space (it may install up to 4.73 MB of files).

The usual advantages of computer aided keys over dichotomous keys apply here; e.g., it is possible to circumvent certain characters in working through the key, and a complete and consistently scored set of character states (a "description") is viewable for each taxon. The key covers 507 taxa and is based on a 66-character matrix including geographic range and host plants. Data are included for all valid species found in the Oriental, Australasian and Pacific areas, and the Mascarene Islands. Special attention was paid to separation of the 68 species in the Oriental fruit fly (*Bactrocera dorsalis*) complex. For this complex several characters are used that are not applied to other species, such as measurements of the male aedeagus and female aculeus. To "complete" the system for worldwide coverage of dacine species of quarantine importance, pest species from the Afrotropical region are also included. This is not a key to Dacini of the world, as about 150 African non-pest species and over 100 other known but undescribed species are excluded. A complete world checklist is included as an appendix.

The user-friendliness of the system is very high. Even upon first use, choice of the "standard" option allows one easily to work through an identification without resorting to help screens. This option automatically chooses the best characters and queries the user with a choice of available character states. The initial screens allow the user to limit the taxa or characters considered based on sex, geographic region, or pest status. For example, choice of only pest species reduces the list to 52 taxa. Each query presents a very clear choice of character states with excellent supporting illustrations, in which character state differences are highlighted by use of color overlays on black and white drawings, and text explanations. At any step in the process, it is possible to review and alter previous character state choices, examine character illustrations, list remaining taxa, preview taxa to be included/excluded by a given character state selection, check the glossary, etc.

For pest taxa, there is significant accompanying text on taxonomy, host plants, identification characteristics, and distribution information that is largely verbatim of that in White & Elson-Harris (1994, Fruit Flies of Economic Significance, CABI, UK, 601 p.) but updated with recent nomenclature, especially from Drew & Hancock (1994, The *Bactrocera dorsalis* complex of fruit flies in Asia, Bull. Ent. Res. Suppl. 2, 68 p.). Good color photographs of actual specimens are provided for almost all pest species. Non-pest species receive only a short catalog entry stating synonymies, distribution, and the specimens examined upon which the character matrix was built. A habitus drawing, distribution map, diagnosis and description (entire character state set) is provided for every species.

Much of the information in the system can be printed out for more convenient usage away from the computer. Especially useful to the working taxonomist is the program's ability to generate a table of character states that vary among as many as five taxa and copy the table to a spreadsheet for printing. This is something that no traditional key or monograph can do and is invaluable for doing a thorough inspection and

comparison of specimens at the microscope. Descriptive text, distribution maps, glossary entries including labeled line drawings of morphological features, and even the color and SEM photos can all be printed out. Complete descriptions and diagnoses of individual species, however, cannot be exported for printing, nor can those screens be printed that illustrate character state choices as one progresses through the key.

Within the Key program is a set of useful appendices. The aforementioned checklist of world Dacini (all described species as of late 1996) is not available elsewhere. Association Data (economically important host plants, arranged alphabetically by genus and by common name with corresponding fruit fly denizens), Methods of Study, Morphology, and other appendices are modified versions of text in White & Elson-Harris (1994).

If the potential user is concerned only with pest species, e.g., a port identifier needing only to recognize pests of quarantine significance, one's library budget is better spent on White & Elson-Harris's 1994 book, which contains nearly all the same information on pest dacines plus a whole lot more on other fruit fly pests and identification of larvae. The book may not be high tech, but it's \$250 cheaper and a truly excellent reference. Museum curators, collectors, surveyors, and other taxonomists who are likely to encounter a diverse assemblage of non-pest species will be most likely to fully utilize and appreciate the wealth of character data presented here. This is a wonderful tool that is well-designed for easy use. Yet, using even this good a tool, one may still arrive at an "answer" and nonetheless feel a nagging doubt about its veracity. Then one must resort to even better tools—comprehensive collections and human experts!

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