BIRDS Is for the Computer

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Introduction

Until recently, computer analysis of bird banding data was largely the province of those banding stations associated directly or indirectly with academic or governmental research facilities. Within the past year or two, however, perhaps because of the widespread availability and declining cost of microcomputers, much interest in using them as a tool for storage and analysis of bird banding data has developed among unaffiliated banders. This interest is reflected in the themes of the 1983 Annual Meeting of the Eastern Bird Banding Association and a recent workshop of the Mid-Atlantic Bird Banding Group: "Computers Are for the Birds." This paper will discuss the computer hardware (the computer itself) and software (or programs) we use in connection with our banding activities and touch on our experiences in obtaining authorization from the Bird Banding Laboratory to submit computer-produced schedules. While other banders will obviously have different record keeping needs, an analysis of our system may provide some useful ideas.

In the Beginning

When embarking on any enterprise, and particularly one involving computers, it is wise to evaluate what you wish to accomplish. In our case, we determined at the outset that we wanted our banding records to be organized, in a reasonably readable form, and to be accessible by a number of different "keys" such as band number, species, time, date, special characteristics, etc. We decided that if we were going to go to the trouble of entering banding data into a computer, we should be able to produce schedules for the BBL. And we concluded that data elements that we collect, but which are not required by BBL for schedules, should be included in the database. The nature of our banding habits (we band throughout the year and handle roughly 5000 new birds annually plus 1000 repeats and returns) determined the design of our record keeping system even before we shifted to the computer.

The Field Sheet

As a first step toward computerizing our banding records, we redesigned our field sheet to minimize the possibility of recording and data entry errors. The old field sheet, based on the Long Point/Manomet form, was designed for use with "big" computers, and as such required a very rigid data format with heavy reliance on numerical data. Our revision eliminates seldom-used data fields, handling them with an expanded remarks section; uses alphabetic data whenever possible, making the form easier to read; and allows sufficient space for the common name to avoid reliance on the cryptic four-letter abbreviations frequently used. We use separate data sheets and a separate computer disk for each band size.

The Computer

When considering a computer, important features to look for are (1) how much software is included—software can cost several thousand dollars if it must be purchased separately, and for this reason alone we recommend against machines manufactured by Apple, Radio Shack and IBM; (2) an 80-column display screen—especially useful if you plan to use the computer for other purposes, such as word processing; and (3) a popular operating system (the control program that enables the computer to store programs on disks), such as CP/M or MS-DOS, which will insure that software will be available. Whether the machine is of 8 or 16 bit design is of little importance. Our computer, a Morrow MD-2, uses two disk drives each holding approximately 190K of data (records for roughly 1500 birds) on 5¼ inch floppy disks. It uses the popular CP/M operating system, and costs approximately $1200, including software but excluding a printer.

Printers range in cost from $200 to over $1000; be certain to select a printer that produces good-quality output if you intend to submit computer-generated banding schedules. Computers similar to ours include the Osborne 1 and the Kaypro II. Were we to start over, we would purchase a machine with larger disk storage capacity, allowing storage of an entire year's worth of the data we generate for a given band size on a single disk.

The Programs

BIRDS (Banding Information Retrieval Data System) is the collection of computer programs we use at the Bestgate banding station to store and manage banding information, verify its accuracy, prepare schedules for submission to the BBL, and, last but not least, reduce con-

version of our field data into a format useful for analysis from a "monumental undertaking" to almost "child's play." Our banding program consists of four parts, one of which is a commercial program, and should run without modification on any computer with a printer similar to ours. When used with other printers, slight modifications of the printer control sequences in the SCHEDULE module may be necessary. Currently, one other bander is using our system, and we expect several others will follow suit shortly using versions modified for different printers.

The first and most important element in any data analysis program is a database management system. These programs, which are available both commercially and in the public domain at costs ranging from free to several thousand dollars, will be used to enter raw data, sort it by various keys, such as species, age, sex, or date, and generate various reports which can then be manipulated or analyzed by other programs such as statistical packages. In selecting a database package, be sure it will accomodate automatic incrementing of the band number and that it provides an easy way to duplicate information from the preceding record.

For data entry and basic analysis, we use a commercial program called Personal Pearl, which was supplied with the computer. Other commercial database programs such as Condor or dBase II, which are more powerful than Pearl, should work equally well. Using Pearl, we have created a computerized "form" identical to our field sheet into which we copy our field data. While it might seem burdensome to type the full data series, including the full common name, for each entry, such is not the case. Pearl automatically increments the band number and allows a single keystroke to duplicate information carried forward from the previous record (thus for a whole string of Myrtle Warblers, most information is entered only once, and is thereafter repeated using the ditto character). In addition, we have defined special-function keys on the computer keyboard to print the full common names of our most common species. These features save a considerable amount of typing.

In designing a data entry system, it really does not matter whether the full common name or the four-letter codes are used—conversion from the codes to the common name is trivial. However it is absolutely vital in terms of error checking that both the AOU number and some form of common name designator be used.

The heart of our schedule and report generation system consists of three program modules written in the BASIC computer language: VERIFY, SCHEDULE, and SUMMARY. VERIFY is an edit program that checks the name and AOU number of a particular bird against a BBL-approved master list and, if it finds an error such as a misspelled common name or a common name and AOU number that do not agree with the table, prints an error message on the printer. While the BBL requires only AOU-species verification, one of the primary advantages of a computer is that it can easily be used to improve the accuracy of schedules and integrity of data by catching other types of errors. We have included other edits for dates (which must be in ascending order), sex (which must be M, F, or U), and age. It would be a simple matter to add others such as a check against HY birds in January, AHY birds of some species, such as Cardinals, in December, or anything else that seems to be a problem. After VERIFY is run, corrections are made in the database and VERIFY is run again. This process is repeated until there are no errors. Once the data are correct, the SCHEDULE program is run to prepare a final banding schedule for submission to the BBL. However before the schedule is actually submitted, it is hand checked against the field sheets to insure that it is completely accurate. While VERIFY can catch the most obvious mistakes, such as entering an age as "ANY" instead of AHY, it will not catch a bird entered as AHY that was, in reality, HY!

The SCHEDULE program translates the data into a form acceptable to the BBL. The data in the computer do not contain ditto characters or lat-long information, but do contain information not required by the BBL, such as wing chords, characteristics used for determining age and sex, time of capture, and net location. SCHEDULE takes this data and, after discarding the extraneous portion, translates our two-letter location code into the lat-long-region information the BBL requires, substitutes a ditto character (we use "|" for duplicated data), and sends the results to the computer's printer. A common problem for those generating computer-produced schedules occurs when a band is destroyed. It seems a shame in those situations to lose whatever data were collected from the bird. Our solution is to alter the common name in those situations so that the first character is an asterisk while leaving the other information unchanged. SCHEDULE recognizes the asterisk and handles the situation for schedule purposes without destroying the remaining data. Of course VERIFY flags the record as erroneous when this occurs.

The final module, SUMMARY, generates a list of birds banded during a given period, giving the total number of each species, the number of birds aged HY, U, or AHY, and the number of males, females, and unknowns. Using the program, we prepared the statistical portion of our fall report for the Atlantic Flyway Review in less than 30 minutes (for around 2800 birds of 97 species), with far greater accuracy than would have been possible doing so manually. SUMMARY could easily be modified to extract other information from the database for further analysis.

Before submitting computerized schedules, one must receive approval from the BBL. Anyone contemplating computerized schedules should first obtain a packet of information on the subject from the BBL, which sets forth the requirements the program must meet and provides other useful information. While we have heard tales of long delays and extensive program revisions being required before receiving BBL approval, this was certainly not our experience, perhaps for several reasons. First, we submitted our program during the summer months, a comparatively slack time at the BBL. Second, we designed the output of our program to look as much as possible like a standard banding schedule, even to the point of using computer generated continuation lines (|) rather than ditto marks (") and printing on both sides of the paper (one-sided forms are acceptable). We further designed the program so that it prints only those locations actually used on a given schedule at the top.

Getting a computerized schedule system up and running is not a trivial undertaking. Our system, which has been in operation since August 1983, still requires occasional tinkering. Nevertheless the rewards of computerization make it worth the effort. Schedule preparation time has decreased by about a third and accuracy has increased dramatically. But best of all, schedule preparation is no longer an end in itself, a mere formality to satisfy permit requirements—we now get a data base that we can use to investigate a wide variety of questions, both serious and nonsensical.

We have donated our programs (except for Pearl, which is copyrighted) to the Mid-Atlantic Bird Banding Group, and will be happy to provide copies and complete documentation, in return for a $10 donation to MABBG, 803 Glen Allen Drive, Baltimore, MD 21229.

(Eastern)

Position Available

VOLUNTEER FIELD RESEARCHERS are needed in Nevada from approximately 1 September-31 October, 1985, to assist with the sixth season of the Goshute Raptor Migration Project. Volunteers will observe, trap, measure, and band migrating raptors atop a 9,000-ft. wilderness ridge in the Goshute Mtns., northeastern Nevada. Minimum two-week commitment required; experienced raptor banders preferred. Some funds may be available to reimburse volunteers' transportation costs. Food will be provided on-site. Volunteers must provide their own tent and sleeping bag. We anticipate observing 7-10,000 raptors, and trapping up to 1,500. Please send inquiries and resumes describing field and raptor experience, and dates of availability to STEVE HOFFMAN, P.O. Box 1382, Albuquerque, NM 87103 (505-242-0291). August 1 deadline.

Correction

Our apologies to Thomas J. Wilmers. In his article "Notes on Incubation by Male Kestrels in West Virginia, Pennsylvania, and Southern Quebec," Vol. 10, No. 1, there are two corrections to note.

On page 7, column 1, paragraph 5, sentence 2 reads: "Capture and banding of kestrels in a wild population has not been previously documented." This should read: Capture and banding of kestrels at night in a wild population have not been previously documented. The words ". . . at night . . ." need to be inserted and "has" changed to "have".

One other error is on page 7, column 1, paragraph 4, sentence 2. The word "other" should read others.