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A BATCH PROCESS COMPUTER INFORMATION RETRIEVAL AND CATALOGUING SYSTEM IN THE FISH COLLECTION NATIONAL MUSEUM OF NATURAL SCIENCES

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A BATCH PROCESS COMPUTER INFORMATION RETRIEVAL AND CATALOGUING SYSTEM IN THE FISH COLLECTION, NATIONAL MUSEUM OF NATURAL SCIENCES

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RÉSUMÉ

Le FIR (Fish Information Retrieval) est un système de traitement par lots, de catalogage mécanographique et de recherche documentaire qu'utilise la Section d'Ichthyologie du Musée national des Sciences naturelles. Il se compose d'une téléimprimante DCT-500, d'un miniordinateur PDP-8/L 4 K et d'une dérouleuse de bande magnétique Cipher, et est relié par téléphone à un ordinateur Univac 1108. Le PDP-8/L et la dérouleuse de bande groupent les données provenant de la téléimprimante et celles provenant du 1108 qui en sortent.

Les données comprennent des numéros de catalogue, des données relatives à la répartition géographique et à la capture des spécimens, des données écologiques et des renseignements sur les espèces elles-mêmes. Les données relatives à la capture des poissons et les mises à jour sont enregistrées au laboratoire dans le champ convenable des feuilles champ/entrée qui servent aussi de feuilles de données à traiter. L'introduction de données sert à mettre à jour le fichier principal et à produire par téléimprimante les fiches du catalogue et les cartes matricule/index. Il est possible d'interroger le fichier principal pour obtenir des listes de renseignements ou des données concernant tel ou tel type de collection.

Les renseignements que contient la documentation sur les espèces peuvent s'introduire dans le système et être récupérés en procédant comme pour la documentation sur les collections. On peut produire si on le désire des fiches-matière et des fiches-auteurs.

Le FIR est donc un système assez complet de mémorisation de renseignements. C'est un instrument précieux de recherche documentaire et bibliographique sur les collections de poissons du Musée, dont il facilite grandement le catalogage.

INTRODUCTION

Museum specimens and their associated collection records contain a valuable store of biological, environmental, and historical information. If readily accessible, this information can be made available to the public and to outside researchers as well as to inhouse researchers for taxonomic, anatomic, life history, ecological, biogeographic, environmental, pollution, and other studies. It is the cataloguing procedures that will largely determine the accessibility of the information and specimens.

Cataloguing and searches for information can be done manually. When the number of records is small and their rate of accumulation is low, when the records are short and the number of indices is small, relative to the amount of technical help, then manual cataloguing and simple searching is feasible. But as the size of these factors increase relative to the amount of technical help, then manual cataloguing and searches will be less practical. The full value of a large or active collection and its records will not then be obtained unless a practical alternative to manual procedures can be found.

One alternative is computerizing. Several generalized museum computer information retrieval systems have been initiated--TAXIR (Estabrook and Brill, 1969), GYPSEY (Addison, 1969), SELGEM (Creighton and Crockett, 1971), and ROM (Anonymous, 1969).

This paper discusses FIR, a specialized batching computer information storage and retrieval system developed as a pilot project for the Ichthyology Unit, National Museum of Natural Sciences, Ottawa. This system, whose computer specifications were set by Michel de Tedesco, Chief of the Information Systems Division, began capturing records in March 1972.

FIR SYSTEM

The Fish Information Retrieval (FIR) system at the National Museum of Natural Sciences was designed under a limited annual budget. Hardware and software are therefore not optimal. In spite of these limitations we believe that the system offers some particularly advantageous features.

The hardware consists of a Digital Equipment of Canada PDP-8/L minicomputer with 4 K of core interfaced with a Cipher magnetic tape unit, a Univac DCT-500 teletype, and ASR-35 teletype and an IBM model B electric typewriter, all located in the Ichthyology Unit. The last two devices are not essential to FIR. The PDP-8/L system is connected by phone to a Univac 1108 computer.

The PDP-8/L system works essentially as a batching input-output device. Data are entered and output on the DCT-500 teletype. Input data are batched onto a magnetic tape and sent over a phone line to the 1108 computer. There, errors are detected and the data are added to the master file. Error messages and formatted data are returned to the PDP-8/L magnetic tape and output on the DCT-500. Queries follow the same route. The flow of cataloguing information is portrayed in Fig. 1.

The PDP-8/L programs are written in PAL III, the Univac programs in FORTRAN V language. All PDP-8/L programs are stored on a magnetic tape and accessed via MINI-TUS, a program which enables particular programs to be selected and read into core. Since there is only one magnetic tape unit, data tapes must be dismounted temporarily to permit remounting of the program tape.

INPUT

Collection data are normally recorded on Field/Input (F/I sheets, Fig. 2) sheets in the field. F/I sheets for donated or purchased collections are filled out at the Museum. In the laboratory the collections and their sheets are assigned accession and catalogue numbers, one of the latter per collection. The species in each collection are sorted and identified. Each species lot is then placed in a container of alcohol ticketted with a pressure-sensitive Hand Label (Fig. 3) bearing catalogue number, number of specimens, the species name, the identifier, and date. This information is then transferred to the back of the appropriate F/I sheet with any particular data on each species lot. The species on the back of a sheet are arranged according to a group number system and are numbered sequentially starting with 1.

After a number of sheets have been prepared and checked they are then ready for input. First the CAPTOR program is read from the program tape into the PDP-8/L core. This tape is then replaced with a data tape. Following an initial message, the number of Catalogue sheets (Fig. 4) and Label/Index cards (Fig. 5) required can be reset from the standard 1 and 3 respectively, if desired.

Input of a record is simple. Each field has a number. Each field number with data is typed on the teletype followed by the data for that field and a carriage return. In some cases the raw data is typed in, e.g., for temperature 22A.13 might be typed in, 22A. being the field number for temperature and 13 being the temperature in degrees Centigrade; or 6.ONT, 6. being the field number for province and ONT the accepted abbreviation for Ontario. In other cases the data is typed in as a code. A tick in a triangle beside a name with its code number on the F/I sheet means that the code number would be typed in; e.g., for field No. 17 (salinity) one of: 1. salt, .2 brackish and .3 fresh, might be ticked. If salt was ticked, then 17.1 would be typed in.

After one field and its data are typed in, a carriage return is made. Some fields may have no data; nothing is typed in for them; one skips to the next field with data.

Before a carriage return has been made, characters can be erased back as far as the beginning of the line. When all the data has been typed in for a sheet, the operator stops and checks the typewritten copy. If an error is noted the field number plus its data are correctly typed in; the second typing of the line will be accepted over the first. If all the lines are O.K. or have been corrected, an E is typed in to signify the end of the record. One then proceeds to the next record.

When all the current batch of records are entered an E is typed in as a new line after the last record, followed by a carriage return, a second E and carriage return, and CTRL/G. The data tape is removed.

As the data feeds into the computer, input lines are filled out to or broken up into 80 character blocks. Each 80-character block is translated into UNIVAC XS3 code and placed into a 320 character buffer. When the buffer is filled, its contents are written onto the magnetic tape.

The communications program 1004SI is then loaded from the program tape, then the data tape is remounted. Following initialization the data is transmitted to the UNIVAC 1108, simulating a Univac 1004 terminal over the phone line.

1108 UPDATE

The 1108 Main Update program adds new records sent from the PDP-8/L to the 1108 master file or updates old records. The incoming records are in catalogue number sequence. The master file is copied down to the position of the first incoming record. New records are then added to the copy; old records may be enlarged, corrected or deleted in whole or in part. Copying then continues with the next old record, new record or update until the new and update records are merged with the old records.

Update records must have the update field, 1B.1, present or they will be ignored. Some records will have computer-detectable errors, i.e., wrong field numbers, wrong kind of data for a field (alpha or numeric) or too many characters. Records with these errors are put in the master file together with a note of the presence of errors. Of course some kinds of input errors are not detected; these should be detected by checking the catalogue sheets and L/I cards output from the master file. Error messages for computer-detectable errors return with and precede returning batches of catalogue and L/I card output data. The necessary update F/I sheets can then be prepared. A catalogue number output from a record with a machine-detectable error is immediately followed by two asterisks.

The master file consists of variable length individual collection records arranged in order of catalogue number. The first entry in a record indicates the length of the record (number of words), followed by a count of the number of fields, a list of the numbers of the fields with data and pointers to

where data is stored, a count and list of errors, if any, and finally, the data for the variously listed fields. Data entered in coded form will be stored in coded form; raw data as raw data.

OUTPUT

For every properly numbered record input to the 1108 computer, catalogue sheet and L/I card data are automatically prepared, decoded if necessary, and transmitted to the PDP-8/L and recorded on its magtape. Additional catalogue sheets and/or L/I card data from any records already in the master file can be requested at any time using the CAPTOR program.

Following the transmission of data to the PDP-8/L magtape, the program DUMPRI is loaded into the PDP-8/L, then the program tape is replaced by the data tape. Count, information and error messages are output on blank paper on the DCT-500 teletype.

The program DUMPUN is then loaded from the program tape and again replaced with data tape. The catalogue sheet forms are mounted and catalogue data is output on them. Then L/I card forms are mounted and data is output onto them.

Catalogue sheets and L/I cards can be checked against the F/I sheets. Errors detected by the user and the computer are corrected using the update facility of CAPTOR and corrected catalogue sheets are automatically printed out following transmission to and return from the 1108 computer.

Correct catalogue sheets are burst and placed in the appropriate binders. The L/I cards are burst and one is placed in the species index file and two (one spare) in each specimen container.

For persons interested in data on any collections or on material that is being lent to them, CAPTOR can be used to specify particular catalogue sheets for printout with DUMPRI and DUMPUN from the master file.

Where there has been a publication on an existing collection, the citation may be entered in field 47.

If it is necessary to interdigitate a collection between two adjacent numbers, a letter or combination of up to 3 letters can be used in the

3 spaces following the catalogue number. But the letter combination VAC is reserved for vacant collection numbers--catalogue numbers unused in a series of used numbers.

LITERATURE MODE

The preceding discussions of input and output have concerned collection data, that is, records associated with actual fish collections. The system can also be used for storing and retrieving information, originating from publications.

In this mode F/I sheets are filled out in the same manner as with ordinary collections except the data comes solely from a publication and the catalogue number is different.

Catalogue numbers in the literature mode must start with L. The first publication in the file is given the catalogue number L0-0001, the second L0-0002, and so on. A catalogue record normally represents a single collection at one place and one time. So if a publication contains more than one collection, the data obviously cannot be recorded on one F/I sheet. In that case the one number is used for the publication, but for each collection reported, a unique letter or combination of letters is added in the 3 letter spaces following the catalogue number; e.g., L0-0012A, L0-0012B.... L0-0012Z, L0-0012AA, L0-0012AB, etc. Up to 17,575 stations could thus be included for one publication. It is unlikely that more than two letters need be used. The letter combination VAC is as before reserved for vacant catalogue numbers in a series of used catalogue numbers.

Subjects can be entered in the field used for genus by using the group number 99. Author and subject cards can then be automatically output when continuous blank 3 x 5 card forms are mounted.

QUERIES

Using the PDP-8/L RTRIVR program, the 1108 master file can be queried and answers can be output. Queries are input and output on the teletype and follow the same batching procedure as cataloguing--translation by

the PDP-8/L and batching onto tape, and transmission over the phone line to the 1108 where they are used to search the master file. The prepared replies follow the same route in reverse.

Ignoring punctuation, queries consist of:

1. The command REQUEST;
2. The request title which gives a distinguishing name to each request which can paraphrase what is being sought;
3. The specification formula which uses the deliminators AND, OR, NOT, =, <, >, MAX (biggest), MIN (smallest) to specify or define the kind of record which is being searched for;
4. The command OUTPUT followed by the field numbers whose content you wish listed from the specified records, or by the command CP which will count the number of records with the specifications you have indicated;
5. END is placed after the last (or only) query to signify that there are no further queries.

Some examples will clarify the above statements.

1) Query:
```
REQUEST, WINTER COLLECTIONS ONTARIO;
6=ONT, AND, 12=DEC, OR, 12=JAN, OR 12=FEB;
OUTPUT; 1A; 8A;
END;
```
Answer:
```
WINTER COLLECTIONS ONTARIO
(NMC) 61-34 LAKE ONTARIO
(NMC) 58-21 OTTAWA RIVER
        etc.
```

2) Query:
```
REQUEST, COUNT NO. COLLECTIONS PERCA FLAVESCENS IN NWT;
6=NWT, AND, 2.2A=PERCA, AND, 2.2B=FLAVESCENS;
OUTPUT; CP;
END;
```
Answer:
```
COUNT NO. COLLECTIONS PERCA FLAVESCENS IN NWT;
5 (collections)
```

3) Query:
```
REQUEST, NORTHERNMOST COTTUS COGNATUS CANADA;
5=C, AND, 2.2A=COTTUS, AND, 2.2B=COGNATUS, AND,
9A=MAX;
OUTPUT; 1A; 8A; 9A; 9B;
END;
```
Answer:
```
NORTHERNMOST COTTUS COGNATUS CANADA;
(NMC) 61-85 GREAT BEAR LAKE 68°N 121°W
```

4) Query:
```
REQUEST, SPAWNING TEMPERATURE & DATE ONTARIO
ETHEOSTOMA NIGRUM;
6=ONT, AND, 2.2A=ETHEOSTOMA, AND, 2.2B=NIGRUM,
AND, 2.6=20;
OUTPUT; 12; 22A;
END;
```
Answer:
```
SPAWNING TEMPERATURE AND DATE ONTARIO ETHEOSTOMA NIGRUM;
29 MAY 1947 15°
3 JUN 1962 13°
```

These examples give a general idea of the type of question that can be asked. All fields except 8B. Locality Description, 46. Additional Data, 47C. Citation and 2.9 Additional Notes on a Species, can be specified. All fields can be output. Much more complicated specifications can be made than were given in the examples--Records of *Stizostedion vitreum* from north of 50 N.L. in clear and colourless, fast-running water over gravel bottoms, in the Arctic drainage, in the month of June.

There exist in addition some specialized commands:

CS Count of the number of species in the master file, with or without specifications;

LA Alphabetical list of taxons in the master file, with or without specifications. Useful for detecting spelling errors in names or in finding what species are available.

SUM Sum of number of specimens in the master file (with or without specifications);

CO A list of other species found in the same collection as specified species with frequency of occurrence. With this command ecological associates of a species can be found.

Subjects of publications entered under group number 99 can be specified or output just as can be done for data in other fields.

DISCUSSION

FIR has several general advantages, shared with most computer cataloguing systems, over manual cataloguing and retrieval.

In manual systems each catalogue sheet, label and file card or duplicate is made out by hand. In computer systems, typing the data record in once on the teletype will automatically produce catalogue sheets, label/index cards, or duplicates when desired, and stores the data for queries.

Where queries are simple and/or the number of records is low, retrieval is easy with either system. But as queries become more complex (search qualifications are more numerous) and the number of records rises, computer retrieval becomes more attractive. If the mapping potential of the computer

is tapped by providing co-ordinate data for a plotter, then the time-consuming task of plotting hundreds of record localities can be discarded.

The error rate in recording data in computer systems is probably about equal to that in manual systems. Most computer systems are programmed to detect certain kinds of errors. If one desires a quite strick error detection system then, funds being available, an appropriate program could be written for the computer. FIR has a trenchant transmission parity error detection system; aside from this, only excessive data length and type of data (alpha or numeric), and catalogue number duplication is automatically checked. However one visual check is made of the copy produced by the inputting on the teletype, and a comparison of the output copy and the source document is usually made.

Compared to handwritten (but not typed) catalogue sheets and labels, the legibility of computer-printed sheets and labels is higher. More complete file cards and labels can be output with less work.

Computer systems also have disadvantages over manual systems. One is less free to change fields and formats in a computer system. One usually has to change programs and computer files as well as forms in a computer system. In a manual system one would only have to change the forms.

Manual systems have little to go wrong with them. Any one of the essential links in the computer system may fail. But even if the computer does "blow", one still has two catalogues--the input sheets and the output catalogue sheets, as well as the index files. So one is no worse off while the computer system is done. Three recent duplicates of the master file of FIR are always kept, one in a different building. If something happens to the current master file, one only has to update a recent duplicate.

Although computer systems can handle upper and lower case, most don't. Computerizing requires a considerable investment in time and money, although once the backlog is in, the running costs are quite moderate.

The computer system will help extract the maximum value from museum records and make it easier to produce catalogue sheets, labels and file cards.

FIR has useful features not found in some cataloguing retrieval systems. Data is input and output in the Ichthyological Unit facilitating the flow of information in and out of the system.

Field/Input sheets enable the collector to make decisions on classification of ecological factors. The form reminds the collector which data to record and makes data easier to record--the field names and units are preprinted; some data have only to be ticked.

Species data are added to the same sheet in the lab and after checking the sheet, it then serves its second function as an input worksheet. Afterwards it can serve as a spare catalogue sheet. The F/I sheet precodes data for input. This avoids the necessity and the chance of error involved in looking up codes in code books. Using the code on the master file saves storage space and search time. Some decoding of replies to queries is, of course, needed.

Input is operator driven. The operator neither has to type in field names when there is no data for them, nor does she have to wait while the computer prints out field names and then indicate that some are empty. When fields do have data, she types in only the field number (not its name) followed by its data, then jumps to the next field which has data. This interactive procedure makes the best use of operator and computer time.

The species names from a collection are stored with the collection data in the file. The collection data is not replicated for the one or several species sharing identical collection data. This saves space in the master file, speeds searches and requires less manipulation of data for output of catalogue sheets.

Documents (catalogue sheets and L/I cards) originate from the master file, not from the input process as in some systems. Parity checks reduce

return line transmission as a source of error in the output documents. Checking the documents for errors is therefore a check on the actual contents of the master file.

Because the PDP-8/L is essentially a batching I/O device, there is no immediate computer detection of errors as would be the case with a time-sharing system. With only one tape drive on the PDP-8/L, program tapes and data tapes must be switched back and forth during input and output. In formulating queries, field number and attribute code numbers must be used rather than their names. However the codes and names are listed together on the F/I sheets, so that with a F/I sheet in front of one it is not too difficult to formulate a query.

SUMMARY

FIR (Fish Information Retrieval) is a working batch process computer cataloguing and retrieval system in the Ichthyology Unit, National Museum of Natural Sciences. It consists of a DCT-500 teletype, a PDP-8/L 4K minicomputer with a Cipher magnetic tape unit connected over a phone to a Univac 1108 computer. The PDP-8/L and magtape batches data accepting input from the teletype and prepared data from the 1108 which is output on the teletype.

Data includes catalogue numbers, distribution, ecological and collection data as well as species data. Collection data and updates are recorded in the field and in the lab on Field/Input sheets. These sheets also serve as input worksheets. Input of data results in updating the master file and output of catalogue sheets and Label/Index cards on the teletype. Queries can be made of the master file, resulting in lists or counts from specified types of collections.

Information from the literature on species can be input into the system and querried similarly to collection records. Subject and author cards can be output if desired.

FIR thus offers a reasonably complete ichthyological collection and literature information storage and retrieval system, as well as a cataloguing tool.

REFERENCES

Addison, C.H. (1969). "What is GYPSEY?" Univ. Oklahoma Computing Center. 8 pp.

Anonymous (1969). "Specifications for an information storage and retrieval system and X, Y co-ordinate digitizer for the Royal Ontario Museum". Ruscom Logics Ltd., Weston, Ontario. 30 pp.

Creighton, R.A. and Crockett, J.J. (1971). "SELGEM: A system for collection management". *Smithson. Information Systems* 2(3):1-24 + 1-3.

Estabrook, G.F. and Brill, R.C. (1969). "The theory of the TAXIR accessioner". *Math. Biosc.* 5:327-340.

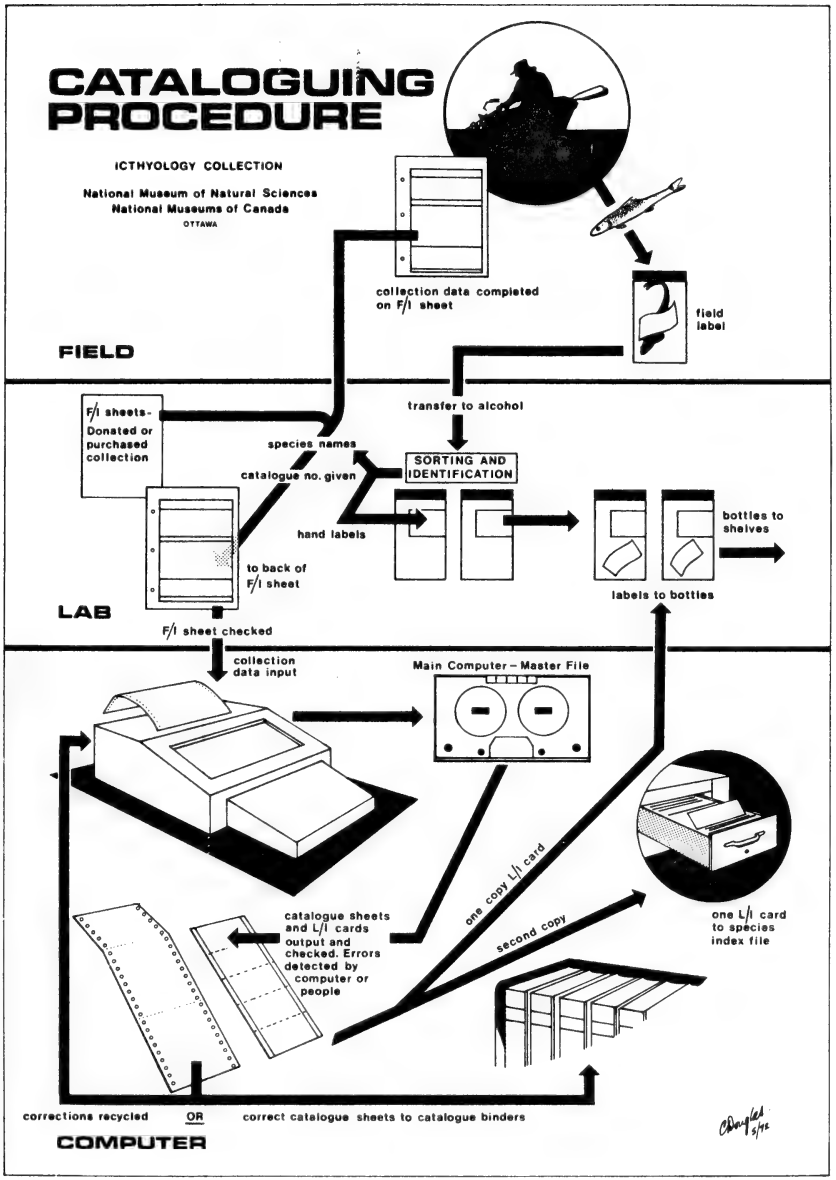
CATALOGUING PROCEDURE
ICTHYOLOGY COLLECTION
National Museum of Natural Sciences
National Museums of Canada
OTTAWA
collection data completed on F/I sheet
field label
FIELD
F/I sheets- Donated or purchased collection
species names
catalogue no. given
transfer to alcohol
SORTING AND IDENTIFICATION
hand labels
to back of F/I sheet
bottles to shelves
labels to bottles
LAB
F/I sheet checked
collection data input
Main Computer – Master File
one copy L/I card
second copy
one L/I card to species index file
catalogue sheets and L/I cards output and checked. Errors detected by computer or people
corrections recycled
OR
correct catalogue sheets to catalogue binders
COMPUTER

Fig. 1.

FIELD/INPUT SHEET — *ICHTHYOLOGY COLLECTION, NATIONAL MUSEUM OF NATURAL SCIENCES, NATIONAL MUSEUMS OF CANADA, OTTAWA, CANADA*

SIDE 1: COLLECTION DATA

A. COLLECTION NUMBERS

1A. LIT. MODE △ — NMC 72 0088 — 1B. CATALOG NUMBER — 1C. LETTER

1D. 1 UPDATE △ — 1E. 1 DELETE △ — 1F. NO. OF CAT. SHEETS & L/I CARDS — 2. ACCESSION NO: 72 136 — 3. STATION/FIELD NO: WM7162 — 4. CRUISE/OLD CATALOG NO:

B. GEOGRAPHICAL DATA

5. COUNTRY (32): C — 6. PROVINCE (STATE) (30): BC — 7. COUNTY (30): PEACE RIVER

8. LOCALITY (136): HIDING CREEK — 8A. WATER BODY — 8B. LOCALITY DESCRIPTION

9. LATITUDE LONGITUDE: 9A. LAT 54° 58' 00" N — 9B. LONG 120° 07' 00" W — TO 9C. LAT — 9CU. — 9D. N/S — LONG 9DU. — W/E — 9E. ALTITUDE: — METRES

△ FOR CHECKING

[B] FOR NUMBERS OR LETTERS

M KM CROSSOUT ONE NOT APPLYING

10. LOCATION ACCURACY: ± (TICK 1) — 1 < 10 KM X — 2 < 20 KM △ — 3 < 40 KM △ — 4 < 200 KM △ — 5 > 200 KM △ — DATA 6 UNCERTAIN △

11. OCEAN/ DRAINAGE (TICK 1) — 1 PACIFIC △ — 2 ATLANTIC △ — 3 ARCTIC X — 4 INDIAN △ — 5 ANT-ARCTIC △ — INTERNAL 6 (DRAINAGE ONLY) △

CANADA & U.S. DRAINAGE ONLY → 7 BAY △ — HUDSON — GULF OF 8 MEXICO △

C. TEMPORAL DATA

12. DATE: 12A. DAY 11 — 12B. MONTH AUG — 12C. YEAR 1971 — 12D. APPROX △

13. TIME COLLECTION STARTED: 1600 (MILITARY HOURS) — 14A. DURATION 00.3 — 14B. HOURS DAYS

D. ECOLOGICAL DATA

15. WATER TYPE (TICK 1; 33)

MARINE: 1 TIDE POOL △ — 2 LAGOON △ — 3 BAY △ — 4 REEF △ — 5 STRAIT △ — 6 COAST △ — 7 OCEANIC △

BRACKISH: 8 ESTUARY △ — 9 SALT MARSH (TREELESS) △ — 10 SALT SWAMP (WITH TREES) △ — 11 LAGOON △ — 12 SALT LAKE △ — 13 SPRING △

RUNNING FRESH: 14 SPRING △ — 15 CAVE △ — 16 CANAL △ — 17 RIVER X — 18 JUNCTION △ — 19 AREA △

STILL FRESH: 20 POOL △ — 21 POND △ — 22 LAKE △ — 23 MARSH (TREELESS) △ — 24 SWAMP (WITH TREES) △ — 25 RESERVOIR △

26 OTHER — 16. HABITAT:

17A. SALINITY (TICK 1) QUALITATIVE: 1 SALT △ — 2 BRACKISH △ — 3 FRESH X — &/OR — 17B. SALINITY QUANTITATIVE: ‰

18A. TIDE ZONE (TICK 1): (QUALITATIVE) 1 SPLASH △ — 2 HIGH △ — 3 MID △ — 4 LOW △ — 5 SUBTIDAL △ — &/OR — 18B. TIDE ZONE: (QUANTITATIVE) M

19. WAVE EXPOSURE (TICK 1) 1 PROTECTED △ — SEMI 2 PROTECTED △ — 3 EXPOSED △ — 4 SURF △ — 20. SECCHI DISK READING: M

21. WATER QUALITY: (TICK 1-2; 30) — CLEAR & 1 COLORLESS △ — CLEAR & 2 BROWN-TINGED X — 3 CLOUDY △ — 4 MUDDY △ — 5 POLLUTED △ — 6 OTHER:

22A. WATER TEMPERATURE: 23.5 °C — 22B. NEG: △ — 23. pH: — 24. DISSOLVED SOLIDS: PPM — 25. OXY-GEN: ML/L

26. STREAM/LAKE/POOL WIDTH: 01.0 — 26U. M KM — 27. LAKE/POOL LENGTH: — 27U. M KM — 28A. DISTANCE OFFSHORE: MIN 3 — 28AU. M KM — 28B. MAX — 28BU. M KM — 29A. DEPTH WATER: MIN 50 — 29AU. CM M FM — 29B. MAX — 29BU. CM M FM — 29C. DEPTH CAPTURE: MIN 0 — 29CU. CM M FM — 29D. MAX 50 — 29DU. CM M FM

30A. METRES WIRE OUT — 30B. WIRE ANGLE: — 31A. CURRENT (TICK 1-2) QUALITATIVE: 1 STILL X — 2 SLOW △ — 3 MED △ — 4 FAST △ — &/OR 31B. QUANT: M/SEC

32. PLANT TYPE (TICK 1-3): 1 ENCRUSTING △ — 2 FOLIOSE △ — 3 SUBMERGENT △ — 4 FLOATING △ — 5 EMERGENT △

SHORE 6 FORESTED △ — SHORE 7 BUSHY X — SHORE BARREN 8 OR GRASSY △ — 33. PLANT/CORAL KIND (NAME 1-2 MAIN KINDS):

34. PLANT AMOUNT (TICK 1): 1 NONE X — 2 SOME △ — 3 MODERATE △ — 4 MUCH △

35. BOTTOM (TICK 1-2; 25): 1 BEDROCK △ — 2 BOULDERS △ — 3 STONES △ — 4 GRAVEL X — 5 PEBBLES △ — 6 SAND △ — 7 MUD △ — 8 CLAY △ — 9 DETRITUS △ — 10 CORAL △ — 11 SHELL △ — LOGS/ 12 BRANCHES △ — 13 OTHER:

36. COVER (TICK 1): 1 NONE △ — 2 SOME X — 3 MODERATE △ — 4 MUCH △

37. ICE EXTENT (TICK 1): 1 NONE X — 2 SOME △ — 3 MODERATE △ — 4 MUCH △ — 38. WEATHER (25): SUNNY

E. CAPTURE DATA

39A. GEAR (TICK 1-2, 37): 1 SEINE X — 2 GILL NET △ — BOTTOM 3 TRAWL △ — BOTTOM 4 DREDGE △ — MIDWATER 5 TRAWL △ — PLANKTON 6 NET △

NEUSTON 7 NET △ — 8 DIP NET △ — PURSE 9 SEINE △ — BAITED HOOK 10 & LINE △ — LURE & 11 LINE △ — MINNOW 12 TRAP △ — LARGE 13 TRAP △

NIGHT 14 LIGHT △ — SLURP 15 GUN △ — 16 SPEAR △ — 17 POISON △ — ANAES-18 THETIC △ — ELECTRO-19 FISHING △ — 20 HAND △

21 DIVING △ — 22 OTHER — CLOSING (TICK 1): 39B. 1 CLOSING △ — NON-1 CLOSING △ — 2 CLOSING △

40. SIZE OF NET OR OF MOUTH OF TRAWL/PLANKTON NET: A. WIDTH 02.0 M — B. LENGTH 06.0 — 41. NET MESH SIZE, STRETCHED: A. SMALLEST 006 MM — B. LARGEST — 42A. SPEED HAULED: KNOTS

42B. DISTANCE HAULED: — 42BU. M KM — 43. SELECTIVITY OF SAMPLE: (TICK 1) 1 ALL KEPT △ — SAMPLE 2 SELECTED △ — 44. VESSEL NAME

45A. PRINCIPAL COLLECTOR: (INITIAL(S)) W — (SURNAME) MENNIE — 45B. OTHER (20) D. DEPLEDGE (COLLECTORS OR INSTITUTION)

△ I PREFERRED INSERT ENGLISH UNITS INSTEAD OF METRIC

N CM = 2.54 CM
1 FOOT = 30.48 CM
1 FATHOM = 1.83 M
1 MILE = 1.61 KM

F. ADDITIONAL DATA

46. (512): BACKWATER

Fig. 2 (a) Front of Field/Input sheet, used for recording data in the field and lab and as a worksheet from which to enter data into the computer.

Fig. 2 (b) Back of Field/Input sheet.

PUBLICATION 47A. AUTHOR(S): 1 2 3 (SURNAME) (INITIALS) 47B. YEAR OF PUBLICATION: 47C. LETTER

47D. TITLE (512):

47E. SOURCE (128):

1. SMALL JAR
2. 2-5 GAL. JAR
3. TANK
4. SKELETAL
5. CLEARED & STAINED
6. ARCHAEOLOGICAL
7. SCALE SLIDE
8. DRIED
9. YOUNG-ADULT
10. LARVAE
11. EGGS
12. HYBRID
13. SPECIMENS NOT KEPT
14. ON LOAN
15. > 1 CONTAINER
16. INCOMPLETE SPECIMEN
17. OTOLITHS
18. RIPE
19. SPENT
20. SPAWNING
24. OTHER (SPECIFY)

1. COUNTS & OR MEASUREMENTS
2. X-RAYS
3. PHOTOS: SPECIMEN
4. PHOTOS: HABITAT
5. COLOR NOTES
6. DRAWINGS
7. LIFE HISTORY NOTES
8. CHROMOSOME COUNTS
9. EXPERIMENTAL FISH
10. PUBLICATION
11. PESTICIDE ANALYSIS
12.
13.
14. OTHER (SPECIFY)

DATA ADDED TO COMPUTE FILE △

1. HOLOTYPE
2. PARATYPE
3. SYNTYPE
4. TOPOTYPE
5. NEOTYPE
6. MS. NAME
7. OTHER (SPECIFY)

SIDE 2. SPECIES DATA

COLLECTIONS & SPECIES DATA COMPLETED & CHECKED △

SPECIES DATA CONTINUED FROM LAST SHEET △

1. CND.	2A. GENUS (5)	2B. SPECIES (7)	2C. SUBSPECIES (2)	2D. FAMILY (20)	3. IDENTIFIER (17) INITIALS SURNAME	4. ID. DATE MONTH YEAR	5. NUMBER OF SPECIMENS	6. SPECIMEN NATURE (1 - 8 NO.)	7. ANCILLARY RECORDS (1 - 9 NO.)	8. TYPE STATUS (1 NO.)
1. 21	Catostomus	catostomus			DE MCALLISTER	JUN 1972	5	1		
2. 21	Catostomus	commersoni			"	"	2	1		
3. 22	Couesius	plumbeus			"	"	22	1		
4. 22	Rhinichthys	cataractae			"	"	4	1		
5. 22	Semotilus	margarita			"	"	11	1		

ADDITIONAL NOTES ON A SPECIES (COLOR, LIFE HISTORY, ETC.), MAY BE ADDED AS FIELD 9, SPECIES NOTES (768).

SPECIES DATA CONTINUED ON NEXT SHEET △

MARCH 1972

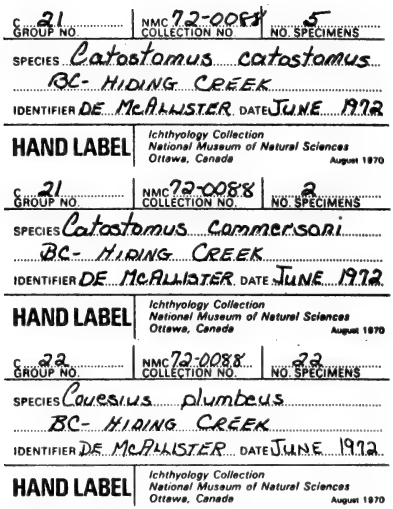

Fig. 3. Hand Label for recording identifications on containers while full computer labels are being processed.

CATALOG SHEET *ICHTHYOLOGY COLLECTION, NATIONAL MUSEUM OF NATURAL SCIENCES NATIONAL MUSEUMS OF CANADA, OTTAWA, CANADA*

1. CATALOG NUMBER: NMC 72-0088

2 NO: 72136 3. STATION/FIELD NO: WM7162 4. CRUISE/OLD CATALOG NO: 5. COUNTRY: CANADA

6. PROVINCE: BC 7. COUNTY: PEACE RIVER

8. LOCALITY: HIDING CREEK

9. LATITUDE-LONGITUDE: 54° 58' 00"N X 120° 07' 00"W

9E. ALTITUDE: M 10. LOCATION ACCURACY: < 10 KM 11. OCEAN/DRAINAGE: ARCTIC

12. DATE: 11 AUG 1971 13. COLLECTION STARTED (TIME): 1600 HOURS. 14. DURATION: 00.3 HOURS

15. WATER TYPE: STREAM/RIVER 16. HABITAT:

17. SALINITY: FRESH ‰ 18. TIDE ZONE: 19. WAVE EXPOSURE:

20. READING: SECCHI DISK M 21. WATER QUALITY: CLEAR & BROWN-TINGED 22. TEMP: 23.5 °C

23. pH: 24. SOLIDS: DISSOLVED PPM 25. OXYGEN: ML/L 26. STREAM/LAKE/POOL WIDTH: 010.0M

27. LAKE/POOL LENGTH: 28. DISTANCE OFFSHORE: 0003M

29. DEPTH OF WATER: 00050CM 28. DISTANCE OFFSHORE (DEPTH CAPTURE): 00000CM - 00050CM 30A. WIRE OUT: METRES

30B. WIRE ANGLE: 31. CURRENT: STILL M/SEC. 32. PLANT TYPE: SHORE BUSHY

33. CORAL KIND: PLANT 34. AMT: NONE

35. BOTTOM: GRAVEL 36. COVER: SOME 37. ICE EXTENT: NONE

38. WEATHER: SUNNY 39. GEAR: SEINE

40. WIDTH & LENGTH OF NET OR OF MOUTH OF TRAWL/PLANKTON NET: 02.0M X 05.0M 41. NET MESH SIZE, STRETCHED: 006 TO MM

42A. SPEED HAULED: KNOTS 42B. DISTANCE HAULED: 0006M 43. SELECTIVITY:

44. VESSEL: 45. COLLECTOR: W MENNIE, D DE PLEDGE

46. ADDITIONAL DATA: BACKWATER

C21 CATOSTOMUS CATOSTOMUS (5)
SMALL JAR

C21 CATOSTOMUS COMMERSONI (2)
SMALL JAR

C22 COUESIUS PLUMBEUS (22)
SMALL JAR

C22 RHINICHTHYS CATARACTAE (4)
SMALL JAR

C22 SEMOTILUS MARGARITA (11)
SMALL JAR

Fig. 4. Catalogue sheet output by the computer.

Fig. 5. A Label/Index card, copies of which are placed in specimen containers and a species index card file.

C 21 | NMC 72-0088 | NO.5
GROUP NO. | COLLECTION NO. | SPECIMENS

SPECIES CATOSTOMUS CATOSTOMUS

LOCALITY CANADA: BC- HIDING CREEK

COLLECTOR W MENNIE — DATE 11 AUG 1971
IDENTIFIER DE MCALLISTER — DATE JUN 1972
SPECIMEN NATURE SMALL JAR

LABEL/INDEX CARD | *National Museum of Natural Sciences, Ichthyology Collection, Ottawa, Canada* 3/72

C 21 | NMC 72-0088 | NO.2
GROUP NO. | COLLECTION NO. | SPECIMENS

SPECIES CATOSTOMUS COMMERSONI

LOCALITY CANADA: BC- HIDING CREEK

COLLECTOR W MENNIE — DATE 11 AUG 1971
IDENTIFIER DE MCALLISTER — DATE JUN 1972
SPECIMEN NATURE SMALL JAR

LABEL/INDEX CARD | *National Museum of Natural Sciences, Ichthyology Collection, Ottawa, Canada* 3/72

C 22 | NMC 72-0088 | NO.22
GROUP NO. | COLLECTION NO. | SPECIMENS

SPECIES COUESIUS PLUMBEUS

LOCALITY CANADA: BC- HIDING CREEK

COLLECTOR W MENNIE — DATE 11 AUG 1971
IDENTIFIER DE MCALLISTER — DATE JUN 1972
SPECIMEN NATURE SMALL JAR

LABEL/INDEX CARD | *National Museum of Natural Sciences, Ichthyology Collection, Ottawa, Canada* 3/72

C 22 | NMC 72-0088 | NO.11
GROUP NO. | COLLECTION NO. | SPECIMENS

SPECIES SEMOTILUS MARGARITA

LOCALITY CANADA: BC- HIDING CREEK

COLLECTOR W MENNIE — DATE 11 AUG 1971
IDENTIFIER DE MCALLISTER — DATE JUN 1972
SPECIMEN NATURE SMALL JAR

LABEL/INDEX CARD | *National Museum of Natural Sciences, Ichthyology Collection, Ottawa, Canada* 3/72

C 22 | NMC 72-0088 | NO.4
GROUP NO. | COLLECTION NO. | SPECIMENS

SPECIES RHINICHTHYS CATARACTAE

LOCALITY CANADA: BC- HIDING CREEK

COLLECTOR W MENNIE — DATE 11 AUG 1971
IDENTIFIER DE MCALLISTER — DATE JUN 1972
SPECIMEN NATURE SMALL JAR

LABEL/INDEX CARD | *National Museum of Natural Sciences, Ichthyology Collection, Ottawa, Canada* 3/72

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