THE UNIVERSITY OF CHICAGO

LATE CRETACEOUS TO PLEISTOCENE CLIMATES: NATURE OF THE TRANSITION FROM A 'HOT-HOUSE' TO AN 'ICE-HOUSE' WORLD

VOLUME FIVE

(Appendix D, The Vertebrate Database User's Manual.)

A DISSERTATION SUBMITTED TO

THE FACULTY OF THE DIVISION OF THE PHYSICAL SCIENCES

IN CANDIDACY FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

DEPARTMENT OF THE GEOPHYSICAL SCIENCES

BY

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CHICAGO, ILLINOIS
JUNE, 1996

APPENDIX D

THE VERTEBRATE DATABASE, v.3.5

"A scientist's job is to ask questions"

Tom Baker (Dr Who)
"City of Death", BBC 1979

This appendix presents a version of the unpublished document *"The Vertebrate Database User's Manual, v.3.0"* (Markwick 1993). This gives a field by field description of the database, as well as a brief outline of the philosophy behind it (see also **Chapter III**).

Modifications have been made to this document to satisfy dissertation formatting requirements and to reflect changes made to the database since 1993; in recognition of these additions this database version is referred to as version 3.5.

THE VERTEBRATE DATABASE USER'S MANUAL

A philosophy for the design, collection and implementation of databases for global paleodistributional data.

Version 3.5

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To understand the Geological Record,

One must first step back[1].

1. The geological record is not an impartial observer of global change. It is a record that is both incomplete and that has been subjected to the vagaries of biases, of various importance, that have influenced both its spatial and temporal character, and consequently any intepretations one invokes from it. Spatially, global change must be viewed in the context of the whole globe; the record of a single locality or region cannot be used as a proxy for the whole planet; this is true for both the present and the past. Temporally, one must recognize that global change in the geological context represents a different scale than those of historical times or even the Holocene; while time intervals of millions of years may be easy to state, they are more difficult to envisage; to treat such intervals as if they were 'events' or historical periods is misleading. Thus to understand the geological record of global change we have to recognize that it is only an impressionist view of what may have existed. If one gets too close one finds that in the greater picture the details have no real meaning.

ACKNOWLEDGEMENTS

During the seven years of design and evolution of this database numerous people have provided helpful comments and criticisms. I would especially like to thank Michael Hulver, who helped me initially understand the intricacies of Double Helix (the precursor of the Helix Express software), and was responsible for the design of the other databases used by the Paleogeographic Atlas Project. Alfred Ziegler and David Rowley allowed me the unlimited use of their Macintosh computers, and provided a springboard for ideas. Although most of the data presently stored in the database was collected and entered by the myself, I would like to thank both Aaron Pietruszka and Mary Weis for help in photocopying. Shangyou Nie provided help with the translation of Chinese papers and Laura Jackson and Susan Markwick with French papers. Were it not for the access to the resources of the libraries of the University of Chicago this project could not have been executed as successfully, I especially extend thanks to the staff at the Crerar Science library, particularly those at the reference desk who endured my repeated questions and frequent interlibrary loan requests. I also acknowledge the helpful input of the following persons: Richard Lupia, John Alroy, Ann Lottes, Scott Lidgard and Andrew Becker. To those I have missed, my apologies.

Financial support for the author was provided through a teaching assistantship at the University of Chicago. Funding for the Paleogeographic Atlas Project is through the continued support of our sponsors[2]: Amoco Production Research, Exxon Production Research, Mobil Exploration and Producing Services, Shell Development Company, Unocal International Oil and Gas, BHP Minerals, and Total.

2. These are the current sponsors of the Paleogeographic Atlas Project. In the past the following companys have also provided support, which is gratefully acknowledged: Arco Exploration and Production Research, British Petroleum, Chevron Oil Field Research Company, Conoco Exploration Research, Digital Equipment, Sun Exploration and Production Company, Texaco USA, and Transworld Energy International

CONTENTS

INTRODUCTION

Global Change research often requires the examination of large volumes of data, and this has been greatly faciliated in the last 5 years by the increasing availablity of powerful database computer software. However, despite the plethora of databases now in existence, few have the advantage of being designed by the researcher who is also responsible for entering and using the data. This is the case for the Vertebrate Database, designed by Paul Markwick and described in this manual.

The Vertebrate Database is a custom built, fully relational database designed using the Helix Express® v.3.5 software produced by NorthCon Technologies, Inc. (NorthCon Technologies, 1992). Users must have this program in order to be able to run the Vertebrate database. Although a step by step guide to operating the database is beyond the scope of this manual the descriptions and "help" comments associated with each field should provide enough information that a prospective user could use this book in that way. Further information can be obtained by contacting the author.

A brief overview of the database is presented in the following sections, followed by a detailed summation of all of the fields used in entering data (Sections A and B). A detailed discussion of abaci and fields used on listings and subforms is not presented. Codes used in this database, and others belonging to the Paleogeographic Atlas Project, are presented in Section D.

Although this database was designed independently, a recent study of the database manual produced for the Evolution of Terrestrial Ecosystems Consortium (ETE) database (Damuth, 1993) indicates that our approaches have been parallel in both structure and field assignments. This indicates that an overall policy for congruence of database design may be not be difficult to achieve, since the observation is that there are very few ways to design a successful system. This manual provides documentation to enable further comparisons and provide a basis for possible policy decisions.

History of Database

The Vertebrate database was originally conceived in 1989 as a tool for a study of fossil crocodilian distributions through the last 100 million years of geologic history (Markwick, 1992; Markwick, 1993). This was intended as a pilot study for a dissertation using Tertiary floras to record the terrestrial climate change across the Eocene-Oligocene boundary. As the crocodilian study has broadened so the database has evolved to answer more questions, such that it now encompasses faunal lists for over 5200 globally distributed vertebrate localities for the middle Cretaceous through to the Present Day. This piecemeal construction has resulted in a database which is now finely tuned having had five years of usage.

The database design was based originally upon a basic design adopted by Mark Horrell and Jiping Yao and augmented by Michael Hulver, while graduate students at the

University of Chicago. However the database, as now used, is vastly changed from these earlier versions. These changes are the sole responsibility of the present author.

Philosophy

Designing a successful database is dependent upon two principal factors: **making it simple enough that it can be used, but comprehensive enough that it will be useful.** Althought the development of the Vertebrate Database has followed this paradigm, the number of fields in each relation is considerable. This reflects the need for qualifying the data. For example, consideration of present day vertebrates indicates that size may reflect some climate parameter (Bergmans' Rule). As a consequence a size information field was added to the TAXA BY LOCALITY relation. But what size? the average? the maximum? Thus it was necessary to provide fields for minimum, maximum and average size (the average is calculated). Despite the large number of fields there is no obligation to fill all fields and an advantage of the Macintosh over PC based databases is that there is no predetermined size for fields (each field only occupies memory when defined).

The Paleogeographic Atlas Project has had some 15 years of experience of making these decisions and this has proved fortuitous in designing the Vertebrate Database. In addition, having the designer of the Vertebrate Database as also the principle data collector and data user, has provided insights into all aspects of the design process, insights that few other database designs can have enjoyed.

But a database is only as good as the data that it contains and one recurring concern has been that the data taken from the literature is often unreliable. In such a broad database, which here includes not only vertebrate paleontology but also stratigraphy, sedimentology, paleoecology, paleoclimatology and tectonics it is often difficult to fully grasp the intricacies of every entry. To this end all information is entered into the database unless blatantly false. Entry forms are designed to distinguish between well or poorly resolved data, whether it be geographic or temporal. Thus a locality described as the "Eocene of India" is only of moderate use, but if that is the only record for India at that time it is important. In this case sorts of the database can be run using the ***Geographic Precision*** (A3.15) code as a means of discriminating such coarse data. As better resolved data is entered such coarse records can be replaced. A further problem is that few complete faunal lists are ever published and one is constantly dependent upon partial lists (particularly biased towards mammal lists) or systematic descriptions. In this instance the user can designate the nature of the faunal list using the ***Nature of faunal data*** field (A3.5), and again sorts can be designed to list only "complete" faunal lists. Such codes are replete throughout the database as the only way of dealing with a literature that is inherently problematic and a record that is at best incomplete. One potential way of dealing with such problems, including the question of temporal scale is to take the information and create composite datasets for a specified interval length and geographic area (say stage by stage and for a 5°x5° grid).

One last point concerning the database is that interpretative fields are kept to a minimum. Interpretation is what the data is used for and should not be muddled with the

data itself. Some interpretation is of course unavoidable, such as for designating the environment or climate. In such cases I have resorted to a broad brush approach, i.e. "fluvial" or "marine", classifications that would be hard to dispute, as opposed to a finer classification such as "ox-bow lake" which may be less easy to demonstrate and which may in any case be beyond the resolution of most locality records used in the database. To this end the database is designed to allow the user to pull back to the resolution at which more confidence may be applied. For instance the distribution of 'crocodilians' may be displayed with more confidence than say the distribution of 'alligators' which may be susceptible to a greater degree of misidentification than 'crocodilians' *per se*. However fields for greater detail are provided since throughout the design process I have felt it important that the range of resolution obtainable using the database not be limited by the database itself.

Aims of the Database and Potential Users

The database is designed to provide information for faunal distributions and diversity through the last 100 million years of Earth History, with particular emphasis on the implications of such patterns to the interpretation of paleoclimate. In addition, questions concerning the implications of broad scale taphonomic, collection and literature biases can be, and have been, addressed, as have the implications of time.

It is hoped that the database will be of use to a variety of users including paleontologists, paleoclimatologists and geologists, whether or not they are interested in vertebrates *per se* or wish to use the database structure for their own datasets. The picture capability of Helix Express means that scanned images of the various taxa can be entered if desired. Such information thus has potential as a teaching tool.

Future Versions

This version deals only with vertebrate information for the last 100 million years, it is hoped that in future versions this will be extended to incorporate the entire history of terrestrial life on Earth. Inclusion of floral data is also envisaged (some 1000 papers have already been collected for this purpose), which will involve only minor modifications to entry sheets and no change to the database structure.

A major update is planned for version 4.0 at which time it is hoped to run the database via a Geographic Information System (GIS). The intention is to ultimately link all of the databases presently operated by the Paleogeographic Atlas Project through such a system. This will include lithologic, floral and tectonic data as well as the vertebrate data described in this manual.

Database Security

The database is divided into two users: Programmer and Data Entry. Programmer allows access to all parts of the database, both custom mode and programming mode. Data Entry allows access to the Custom mode only.

Both the Programmer and Data Entry modes are guarded by passwords.

Basic Database Structure

The database is a customized fully relational database constructed using the database software Helix Express v.3.5 (NorthCon Technologies, 1992). The collection is divided into six principle components: ***MAIN REFERENCES*** for reference information; ***MAIN TAXA*** for taxonomic information (excluding the standard taxonomy); ***MAIN LOCALITIES*** for locality information (stratigraphy, environment, location etc.,); and ***MAIN TAXA BY LOCALITY*** for linking taxa with the localities in which they occur; ***MAIN CLIMATE STATIONS*** for climate station data (initially utilizing the 1062 stations given in Müller, 1982); and ***MAIN TAXA BY CLIMATE STATION*** for linking extant taxa with the climate stations which fall within the taxon's geographic distribution. Subsidiary relations then act as lookups to these main relations. The overall structure is illustrated on the following page. Each record must, by definition, have an unique qualifier (see separate sections for qualifiers) and these are used to link the various relations.

The ***MAIN REFERENCES*** relation is linked via the field ***Reference #*** to all other relations. It is the only place within the collection that reference information may be entered. The relation ***JOURNAL LOOKUP*** provides a source of journal information and is linked to the ***MAIN REFERENCES*** relation via the field ***Journal Name***. This information (the journal name) is accessed by way of a dynamic pop-up menu in the **ENTER REFERENCES** entry form on the **♦DATA ENTRY♦** menu (see Section A1).

The ***HELP*** relation is the only other relation that has links to all other relations. Information within this relation may be accessed from forms elsewhere in the collection using sequence buttons titled HELP.

The ***MAIN TAXA*** and ***MAIN LOCALITIES*** relations are the sole entry points for the taxonomic and locality data used throughout the collection. Both have unique record identifiers, ***Taxon#*** and ***Locality#*** respectively. Information within these relations is linked by the ***MAINTAXA BY LOCALITY*** relation using the **ENTER TAXA BY LOCALITY** entry form. These three relations are the most important since entry sheets from all three must be filled before a taxon can be tied to a particular locality. Although this may sound both complicated and confusing at first with use of the database the logic of this approach becomes evident: once a taxon has been entered once in the ***MAIN TAXA*** relation it need never (and should never) be entered again irrespective of

how many localities it occurs at, since with every new locality the user only need lookup the appropriate taxon number (***Taxon#***) and enter this in the appropriate field on the **ENTER TAXA BY LOCALITY** entry form in the ***MAIN TAXA BY LOCALITY*** relation. Similarly once a locality has been entered once it is in the database no matter how many taxa may be found to apply to it. The relations ***MAIN CLIMATE STATIONS*** and ***MAIN TAXA BY CLIMATE STATIONS*** refer to present day data only. However, the taxon information is sourced from the ***MAIN TAXA*** relation.

All other relations are secondary since users do not need to enter data in to them. They operate as lookups for the Primary relations. Thus, the ***STANDARD TAXONOMY*** relation contains the standard taxonomy used throughout the database. This is automatically accessed when a new taxon is entered into the ***MAIN TAXA*** relation using the Genus name entered. If a match is found the database will use the information in the ***STANDARD TAXONOMY*** to fill in the appropriate higher taxonomy in the ***MAIN TAXA*** relation.

All of these relations contain a primary entry form, each of which is described in detail in the following sections. In addition there are listings which utilize subforms, which often require links between relations. These are not discussed in detail in this manual.

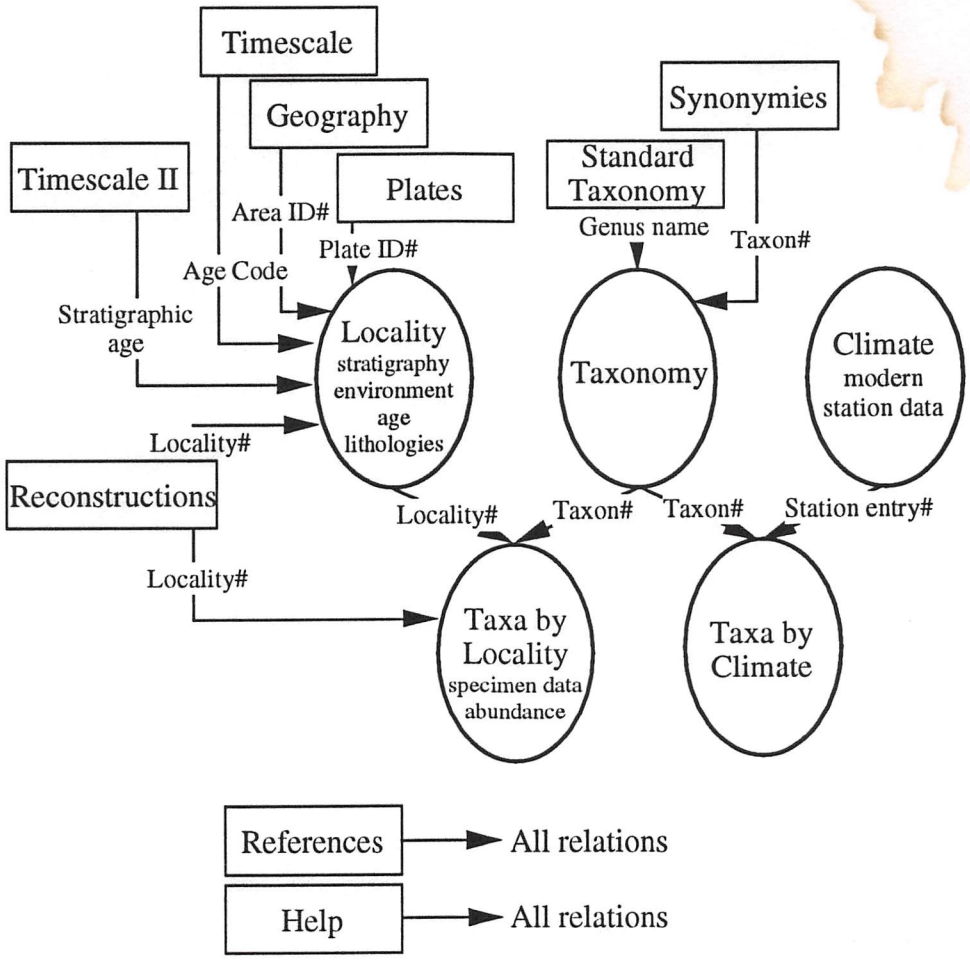

FIGURE A4.01 Database structure.

The principal relations are shown as ovals, subsidary relations by rectangles. The linking field(s) between relations is shown on each appropriate arrow.

Default Menus

These include the following menus that are given at the top of the screen in Custom mode: ♦**FILE**♦, ♦**EDIT**♦, ♦**USER**♦ and ♦**VIEW**♦. These are the default menus for Helix Express®, with the exception of the **QUERY FOR LOCALITIES** entry on the ♦**VIEW**♦ menu. For information concerning these fields users are referred to the Helix Express manuals (Harmon, 1991; Harrington, 1992), although most of the functions are self explanatory. However a brief outline of the functions listed under the ♦**VIEW**♦ menu is given below since this will explain the sorting and entry capabilities of the database software and illustrate the potential of this database.

QUICK QUERY <⌘G>

The **QUICK QUERY** command provides a means of rapidly searching for records that satisfy specified search parameters. In the relation you wish to query select the entry form that contains the field or abacus that you wish to use to limit the query. Click on that field/abacus so that it becomes highlighted. Now select **QUICK QUERY** from the menu. A menu bar will appear across the top of the form. Use this to limit the query, then push <TAB>. The query will then be made.

OPEN QUERY <⌘O>

The **OPEN QUERY** command provides a means of searching for records that satisfy more detailed search parameters. Access the form that you wish to query. Now select **OPEN QUERY** from the menu. A template will appear which has been custom made for the relation that you are accessing. In general the template will be exactly the same as the main entry form for that relation, e.g. in the ***MAIN LOCALITIES*** relation the open query form for most listings and forms is the **ENTER LOCALITIES** entry form. To specify your query click on the relevant fields shown and fill in the template that appears. It is recommended that if this is not clear you consult the Helix Express Manuals.

One consequence of having the entry form as the template for the open query is that within a relation queries and sorts can be made on any individual or combination of fields. The more detailed the query the longer the search will take, but the potential of this query should be readily apparent.

QUERY FOR LOCALITIES

The **QUERY FOR LOCALITIES** query is designed specifically for forms which contain subforms with locality information. If this is the case with the form you've accessed then use this query.

SORT ORDER...

All listings and forms have indexes associated with them. The **SORT ORDER...** function allows the user to chose which index should be used for the form or listing at any one time.

ENTER

Enters a record into the database. Pressing the <ENTER> key has the same effect.

STATIC ENTER

This allows data that has been entered to remain visible.

FIND FIRST <⌘1>

Using this function accesses the first record for an entry form. Remember that the index you have active will affect which entry is found first.

FIND NEXT <⌘2>

Using this function accesses the next record for an entry form. Remember that the index you have active will affect which entry is found.

FIND PREVIOUS <⌘3>

Using this function accesses the previous record for an entry form. Remember that the index you have active will affect which entry is found.

FIND LAST <⌘4>

Using this function accesses the last record for an entry form. Remember that the index you have active will affect which entry is found.

CLEAR FORM <⌘F>

This will produce a clean form for the form you have accessed. If the form is an entry form and contains the numbering abacus (e.g. ***ing#***) the **CLEAR FORM** function will automatically give you the next number that follows the last number to be used.

REVERT

Restores the record to its previous state.

DELETE <⌘D>

Deletes the record presently open on the desktop.

DELETE ALL

Deletes all records in a listing. This is only available to the Programmer to avoid any unnecessary grief.

POST ALL

See the Helix Express manual. Only available to the programmer.

ABBREVIATIONS AND FORMATS USED IN THIS MANUAL

The following formats for designating headings and field names are used in the text:

FIELDS[3]

Field names referred to in the text are written in ***bold italic***. Field names are the informal terms for each entry field in the database. In general, the names are the same as those given as field headings and the internal names in the programmer mode.

Field headings referred to in the text are written in **bold**. Field headings refer to the text preceding, or associated with, the entry fields on entry forms.

Field and abacus names as used within the database (programming mode) are referred to as 'Internal names' and are written in **underlined bold, 10pt**.

MENUS

Menu headings are written in the following way in this manual and apply to the headings at the top of the screen in custom mode, ♦**MENU HEADINGS**♦ referred to in the text are enclosed by diamonds and written in ♦**BOLD UPPER CASE**♦.

NAMES ON MENUS (Listings, displays, etc.) referred to in the text are written in **BOLD UPPER CASE**

RELATIONS

RELATION NAMES are written in ***ITALIC UPPER CASE***

---

3. The distinction between the field name and the internal name is subtle. The field name in this context refers to the field that appears on the entry forms or listings in custom mode, and is generally the same as the heading that precedes it. In general the field name and internal name are either exactly the same or very similar. However because there are a few exceptions, especially in the case of abacii, they are treated separately in this manual.

LINKS

Links between fields or host forms and subforms are represented by the following symbol, ⇔. Thus in the form **DUMP (BY FAMILY) DATA FOR PLAT DIVERSITY** (section C3.2.) the host form is linked to the subform through the fields **Family inert** and **MAIN Family** respectively and this is written "**Family inert (host form) ⇔ MAIN Family (subform).**

ENTRIES

"Entries" (as used in examples) are indicated by placing the entry in inverted commas "". Thus the entry 1000 will appear in this manual as "1000".

KEY COMMANDS

<Key commands> referred to in the text are indicated by <> symbols and the upper case form of the key name. Therefore reference to the return key will appear in this manual as <RETURN>

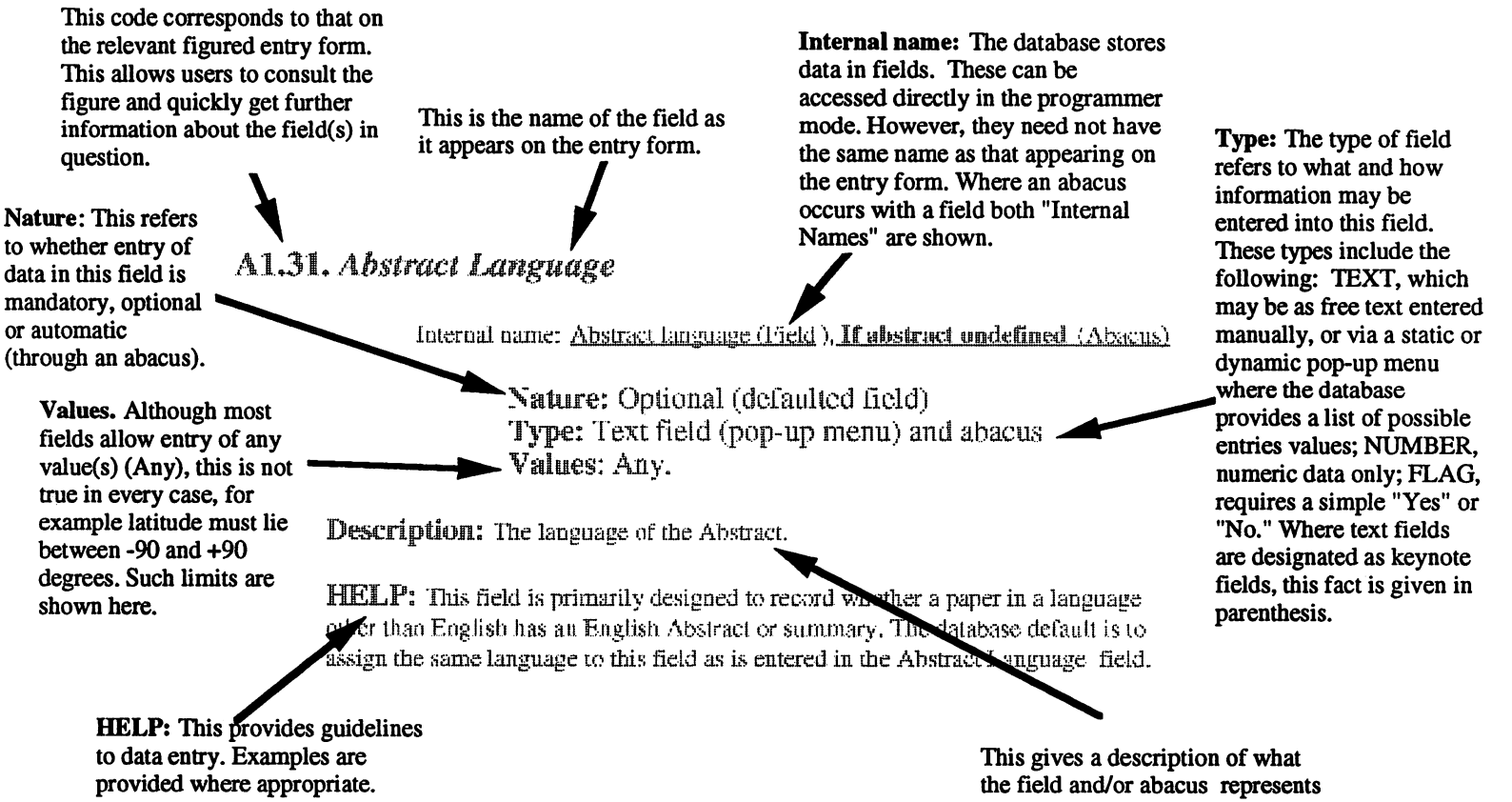

FIGURE A4.02 Key to the field descriptions used in this manual .

The example used is shown in gray to differentiate it from the annotations.

A. PRIMARY DATA ENTRY

This section deals with the six primary data entry forms: **ENTER REFERENCES; ENTER MAIN TAXONOMY; ENTER LOCALITIES; ENTER TAXA BY LOCALITY; ENTER CLIMATE STATIONS;** and **ENTER TAXA BY CLIMATE STATION.** These are the primary sites of data entry within the database and the only parts that most user's will need to access. Entry forms referred to here as Secondary Data Entry forms refer to relations within the database that provide lookup tables for the primary entry forms. For example the relation ***TIMESCALE*** contains the entry form **ENTER TIMESCALE.** The information within this relation has already been entered and acts as a lookup table whenever timescale codes are entered in other relations. Access is maintained in order that changes in chronostratigraphic ages can be entered as or when they occur.

For each relation the principal entry form is figured. In each case the top rendition provides a key to subsequent explanations about each field (use the labels A1.2, B2.15, etc., to find the appropriate information, in some cases one label applies to more than one field). The lower figure shows the same view but of a sample record.

A1. ENTER REFERENCES

Relation: ***MAIN REFERENCES***

Unique record identifier: ***Reference#***

Menu Location: ***♦DATA ENTRY♦***

Accessibilty: ***PROGRAMMER and DATA ENTRY.***

This entry form is the point of entry for all reference information into the database. Fields are described below in the default order in which they appear on the entry form. The link between this form and all others in the database is the field ***Reference#***. Where ever the heading **Ref#** is found on other data entry forms the reference number applicable to the reference that is to be cited should be entered. If you're not sure which that is then access the listing **LIST REFERENCES** from the **♦LISTING♦** menu.

General information concerning the references contained in the database can be found under the menu **♦OTHER♦**. This includes the total number of references in the whole collection (**TOTAL REFERENCES**), a breakdown of all references by language (**TOTAL REFERENCES BY LANGUAGE**) and a breakdown by the decade in which they were published (**TOTAL REFERENCES BY YEAR**).

The **ENTER REFERENCES** entry form has not been designed to facilitate specific subject searches. If a bibliography for specified parameters is desired use the other entry forms and use the **OPEN QUERY** function to find all references that are applicable. The Paleogeographic Atlas Project does have its own Bibliography Database (also using the Helix Express software), which now contains over 22,000 references and will ultimately contain all of the references used in this database. All of the references used in this database are presently also entered into a bibliography built using the Endnote software (Endnote, 1990-1991) which does contain keywords.

Information concerning the location of references is biased towards Chicago libraries. This reflects the origins of the database as part of the author's Ph.D. at the University of Chicago.

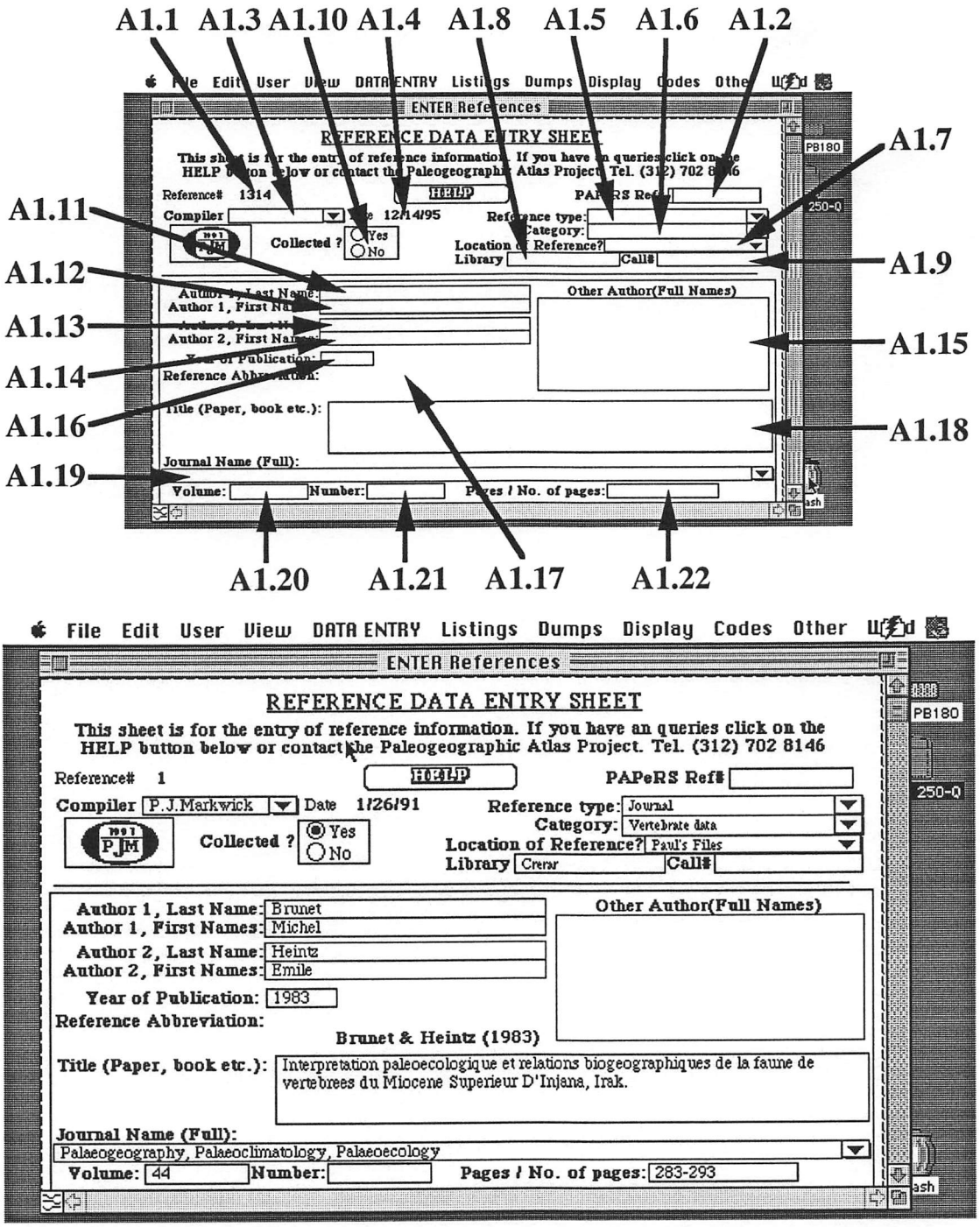

FIGURE A4.03. Screen pictures of the principal entry form in the 'Main References' relation.

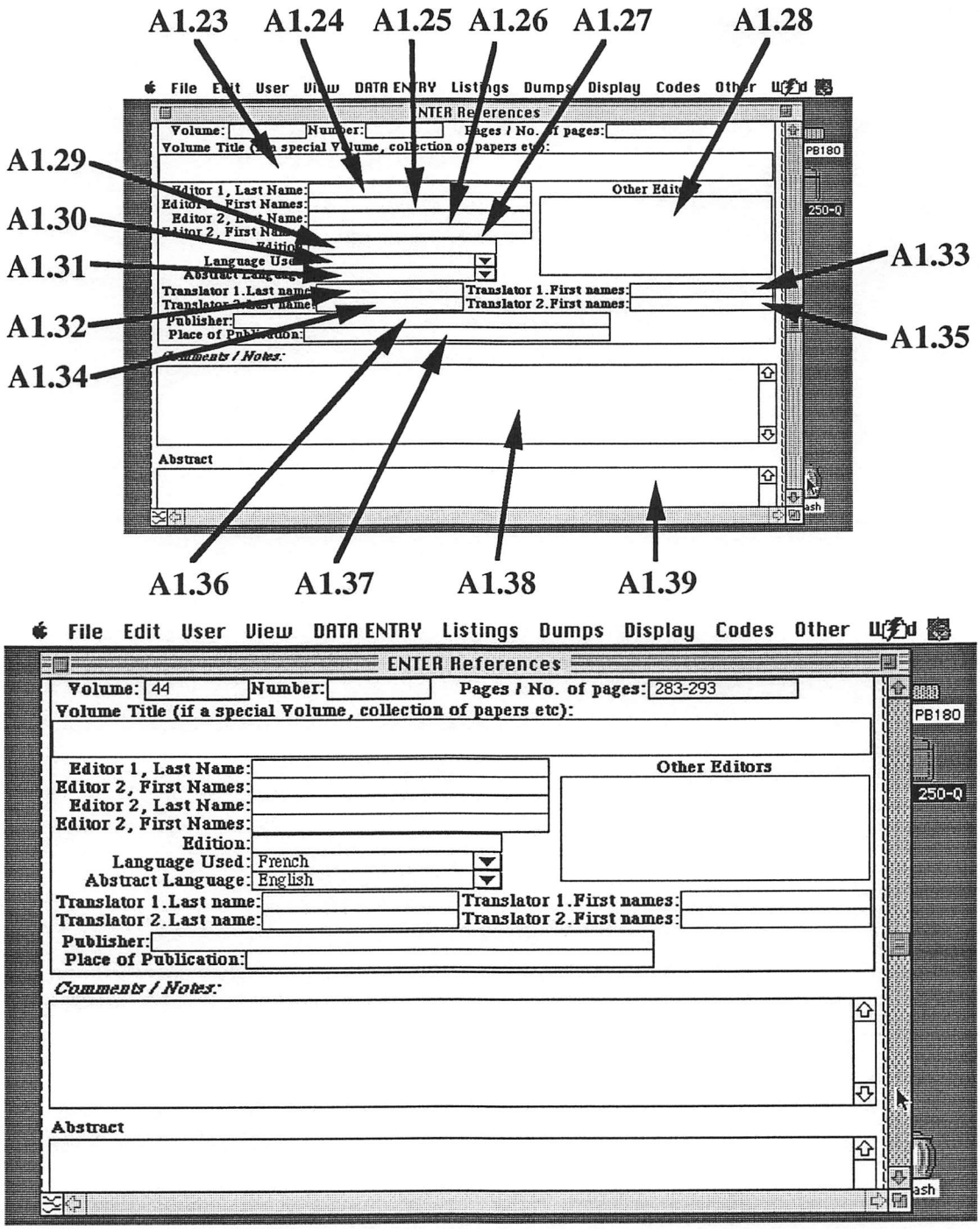

FIGURE A4.03., continued.

A1.1. *Reference #*

Internal names: Reference# (Field), ing# (abacus)

Nature: MANDATORY (Defaulted field)
Type: Number field and abacus
Values: any integer (Default strongly recommended)

Description: This is an arbitrary, but unique, number that the computer uses to facilitate searches and links. On the other entry forms this is the number required in fields prefixed by the word 'Ref#'. The computer automatically generates this number.

HELP: Don't change this unless absolutely necessary in order to avoid duplicates. Selectability of this field is maintained in order to facilitate queries.

A1.2. *PAPeRS Ref#*

Internal names: PAPeRS# (Field)

Nature: Optional
Type: Number field
Values: any integer

Description: The Paleogeographic Atlas Project code number for references on the PAPeRS database.

HELP: The Paleogeographic Atlas Project (PAP) has its own reference database system called PAPeRS. Each reference on that database has a unique reference number which will be different from that used in the field ***Reference#*** on this database. If the reference you're entering is also in the PAP database put the relevant PAPeRS reference number in this field.

A1.3. *Compiler*

Internal names: Compiler (Field)

Nature: Optional
Type: Text field
Values: any

Description: The name of the person(s) who initialized this record.

HELP: In this field enter the name or initials of the person entering the reference information. e.g. "P.J.Markwick" or "PJM" etc. This allows the database manager to keep a record of entries and users.

A1.4.*Date*

Internal names: Date (Field), Today (Abacus)

Nature: Optional (Defaulted / Non -selectable).
Type: Date abacus and field
Values: Date, such as "5th June 1964", or "6/5/64"

Description: This is the date when the information was entered. The computer will fill this field automatically.

HELP: It is recommended that the default for this field, which the computer generates, should not be changed. Consequently this field is not selectable, i.e. you will not be able to access this field except via Full Mode, which is only accessible to the programmer.

A1.5.*Reference type*

Internal names: Type of reference? (Field)

Nature: Optional
Type: Text field (static pop-up menu)
Values: Any. The following options are provided and recommended:

Book
Book section
Computer program
Conference
Edited book
Journal
Newspaper
Thesis

Description: The type of reference is used for formating bibliographies.

HELP: This field is a pop-up menu field which means that the user has only to click on the field and select from the choices shown. Alternative entries also can be typed in.

A1.6. *Category*

Internal name: Reference category (Field)

Nature: Optional.
Type: Text field (static pop-up menu)
Values: Any. The following options are provided and recommended:

Atlas

Biogeography
Biology
Geology
Locality Data
Paleoclimate
Review
Stratigraphy
Systematics
Vertebrate Data

Description: The nature of the reference in this record. This is used to facilitate the sorting of the references used according to the information they contain (e.g. vertebrate locality information, paleoclimate etc.).

HELP: This field is a pop-up menu field which means that the user has only to click on the field and select from the choices shown. If for some reason there is not a suitable category use the 'See Comments' option and write the category you think the paper fits into in the comments field at the bottom of this entry sheet.

A1.7. *Location of Reference Used?*

Internal name: Location_of_reference_used (Field)

Nature: Optional.
Type: Text field (pop-up menu)
Values: Any. Options provided are based on use at the University of Chicago

Crerar Library[4]
FMNH Library[5]
PAP Files[6]
Paul's Files[7]
PC & SL Files[8]
Regenstein[9]

4. Crerar Science Library, University of Chicago

5. Field Museum of Natural History, Chicago. This applies to not only the main library at the Museum but also all the departmental libraries.

6. Paleogeographic Atlas Project library, rm 201, Department of Geophysical Sciences, University of Chicago.

7. The personal files of the author

8. Dr Peter Crane and Dr Scott Lidgard. Field Museum of Natural History, Chicago. Generally applies to papers concerned with Cretaceous floras.

9. Main library, University of Chicago.

See comments

Description: The location where the reference is presently housed.

HELP: Click on the field and chose from the list of alternatives given. The location means the present location, e.g. if the references entered in this record has been returned to the Crerar Science library enter 'Crerar Library'. The empty field below this field (***Library code***, A1.9) may be used for library numbers, e.g. QE1.S345 etc.

A1.8. *Library*

Internal name: Library_used (Field), Lookup_library (Abacus)

Nature: Optional.
Type: Text field
Values: Any

Description: The location where the source reference is presently housed (usually Chicago libraries, where the reference was physically found). This differs from the ***Location of Reference Used?*** field, which gives the place where the copy of the reference used in the database is stored. If the database recognizes the journal name entered in the ***Journal Name (Full)*** field, the Chicago library where that journal is found is automatically entered in this field.

HELP: This is for housekeeping within the database.

A1.9. *Library code (Unnamed field)*

Internal name: Code# (Field)

Nature: Optional.
Type: Text field
Values: Any.

Description: Enter the library code where this reference was found in this field. If the database recognizes the journal name entered in the ***Journal Name (Full)*** field, the code appropriate to that journal in the University of Chicago library system is automatically entered in this field.

HELP: This is for the library code of the reference, e.g. QE1.S345 etc.

A1.10. *Collected ?*

Internal name: Collected/Not_Collected (Field)

Nature: Optional.
Type: Flag field
Values: 'Yes' or 'No'

Description: Whether the reference has been collected and utilized in the database.

HELP: This is a simple Yes or No field. If the paper has been collected (even if it has then been returned to the library) click on the 'Yes' button. All other cases use the 'No' button. For instance on reading through a bibliography you may find a paper that would be useful to get. By entering it into the database and defining this field as No you have recorded this fact. This allows listings of all references that still need to be collected (NC) to be made.

A1.11. *Author 1, Last Name*

Internal name: Author1, LAST NAMES (Field)

Nature: MANDATORY.
Type: Text field
Values: Any.

Description: The last name of the first author in this field.

HELP: e.g. if the author's name is Russell W. Graham, then enter "Graham" in this field.

A1.12. *Author 1, First Names*

Internal name: Author1, FIRST NAMES (Field)

Nature: MANDATORY.
Type: Text field
Values: Any.

Description: The first name(s) or initial(s) of the first author in this field

HELP: e.g. if the author's name is Russell W. Graham, then enter "Russell W." in this field

A1.13. *Author 2, Last Names*

Internal name: Author2, LAST NAME (Field)

Nature: MANDATORY if applicable
Type: Text field
Values: Any.

Description: The last name of the first author in this field

A1.14. *Author 2, First Names*

Internal name: Author2. FIRST NAMES (Field)

Nature: MANDATORY if applicable
Type: Text field
Values: Any.

Description: The first name(s) or initial(s) of the second author in this field

A1.15. *Other Authors (Full Name)*

Internal name: Other authors (Field)

Nature: MANDATORY if applicable
Type: Text field
Values: Any.

Description: Authors names if more than two authors are cited.

HELP: If there are more than two authors enter the remaining authors in this field. First name(s) / initial(s) followed by last name. Separate each name by a comma. e.g. for a paper authored by the following David B. Rowley, A.M. Ziegler and Nie Shangyou, "Nie Shangyou" should be entered in this field.

A1.16. *Year of Publication*

Internal name: Year of publication (Field)

Nature: MANDATORY
Type: Number field
Values: Any integer.

Description: Enter the year of publication of the reference.

HELP: E.g. for Russell, 1987, enter "1987" in this field.

A1.17. *Reference Abbreviation*

Internal name: Reference Abbrev. (Field), Reference abbreviation abacus (abacus)[10]

10. The Reference abbreviation abacus includes the following abaci: Reference abbr. 1 author, Reference abbr. 2 author, Reference abbr. >2 author.

Nature: Defaulted Field
Type: Text abacus and field
Values: Any.

Description: Reference abbreviation.

HELP: The computer will provide an entry for this field based on the entries given for author names and year of publication. The default format is for the authors to be followed by the year of publication in parentheses; more than two authors are abbreviated by the last name of the first author followed by " et al". This field may be changed and the default overwritten if desired. E.g., for Graham W. Russell, 1987 the abbreviation will be "Russell (1987)"; for the paper authored by David B. Rowley, A.M. Ziegler and Nie Shangyou, the abbreviation will be "Rowley et al. (1987)". Don't worry about this field, the computer will define it for you.

A1.18. *Title (Paper, book etc.)*

Internal name: Title (Field)

Nature: MANDATORY
Type: Text field
Values: Any.

Description: The full title of the article in this field.

HELP: There is no need to put the title in inverted commas, see example.

A1.19. *Journal Name*

Internal name: Journal (Field)

Nature: MANDATORY if applicable
Type: Text field (dynamic pop-up)
Values: Any.

Description: The journal name of the reference if applicable.

HELP: Use the dynamic pop-up menu to find the journal name required. If the journal name is not present there are two options: 1. enter the journal name as given in the reference; 2. Open **ENTER JOURNALS** (menu ♦**DATA ENTRY**♦) and enter the new journal name, then return to the **ENTER REFERENCE** form (menu ♦**DATA ENTRY**♦) and use the dynamic pop-up listing which should now have the newly entered journal name.

A1.20. *Volume*

Internal name: Volume (Field)

Nature: MANDATORY if applicable
Type: Text field
Values: Any.

Description: The issue volume number as given in the reference if applicable.

A1.21. *Number*

Internal name: Number (Field)

Nature: MANDATORY if applicable
Type: Text field
Values: Any.

Description: The issue number as given in the reference if applicable.

A1.22. *Pages / No. of pages*

Internal name: Page Numbers/no. of pages (Field)

Nature: MANDATORY if applicable
Type: Text field
Values: Any.

Description: The page numbers of the article or book referenced.

HELP: Articles should be entered in the form 21-23; for books the number of pages should be entered e.g. 21.

A1.23. *Volume Title (if a special volume, collection of papers etc.)*

Internal name: Special Volume Title (Field)

Nature: MANDATORY if applicable
Type: Text field
Values: Any.

Description: Special volume name.

HELP: In cases where the article referenced is part of a special volume, symposia or book enter the name of the volume / book etc., here.

A1.24. *Editor 1, Last Name*

Internal name: Editor_1 (Field)

Nature: MANDATORY if applicable
Type: Text field
Values: Any.

Description: The last name of the first editor in this field

A1.25. *Editor 1, First Name(s)*

Internal name: Editor_1_First_Name (Field)

Nature: MANDATORY if applicable
Type: Text field
Values: Any.

Description: The first name(s) or initial(s) of the first editor in this field

A1.26. *Editor 2, Last Name*

Internal name: Editor_2_Last_Name (Field)

Nature: MANDATORY if applicable
Type: Text field
Values: Any.

Description: The last name of the second editor in this field

A1.27. *Editor 2, First Name(s)*

Internal name: Editor_2_First_Name (Field)

Nature: MANDATORY if applicable
Type: Text field
Values: Any.

Description: The first name(s) or initial(s) of the second editor in this field

A1.28. *Other Editors*

Internal name: Editors_other (Field)

Nature: MANDATORY if applicable
Type: Text field

Values: Any.

Description: Authors 3 or more.

HELP: If there are more than two editors enter the remaining editors in this field. First name(s) / initial(s) followed by last name. Separate each name by a comma.

A1.29. *Edition*

Internal name: Edition (Field)

Nature: Optional
Type: Text field (pop-up menu)
Values: Any.

Description: The language in which the paper is principally written.

HELP: E.g. "English". A pop-up menu with a list of possible entries is provided.

A1.30. *Language Used*

Internal name: Language used (Field)

Nature: Optional
Type: Text field (pop-up menu)
Values: Any.

Description: The language in which the paper is principally written.

HELP: E.g. "English". A pop-up menu with a list of possible entries is provided.

A1.31. *Abstract Language*

Internal name: Abstract language (Field), If abstract undefined (Abacus)

Nature: Optional (defaulted field)
Type: Text field (pop-up menu) and abacus
Values: Any.

Description: The language of the Abstract.

HELP: This field is primarily designed to record whether a paper in a language other than English has an English Abstract or summary. The database default is to assign the same language to this field as is entered in the ***Abstract Language*** field.

A1.32. *Translator 1. Last name*

Internal name: Translator_1_last_name (Field)

Nature: Optional
Type: Text field
Values: Any.

Description: Translator's last name.

A1.33. *Translator 1. First name*

Internal name: Translator_1_first_name (Field)

Nature: Optional
Type: Text field
Values: Any.

Description: Translator's first name(s) or initial(s).

A1.34. *Translator 2. Last name*

Internal name: Translator_2_last_name (Field)

Nature: Optional
Type: Text field
Values: Any.

Description: Co-translator's last name.

A1.35. *Translator 2. First name*

Internal name: Translator_2_first_name (Field)

Nature: Optional
Type: Text field
Values: Any.

Description: Co-translator's first name(s) or initial(s).

A1.36. *Publisher*

Internal name: Publisher (Field)

Nature: Optional
Type: Text field
Values: Any.

Description: Publishers full name.

A1.37. *Place of Publication*

Internal name: Place of Publication (Field)

Nature: Optional
Type: Text field
Values: Any.

Description: Place of publication, as given in the reference.

A1.38. *Comments / Notes*

Internal name: Comments/Notes (Field)

Nature: Optional
Type: Text field
Values: Any.

Description: For any notes, comments applicable to the reference

A1.39. *Abstract*

Internal name: Abstract (Field)

Nature: Optional
Type: Text field (Keyword)
Values: Any.

Description: The abstract for the reference can be entered here.

A2. ENTER MAIN TAXONOMY

Relation: ***MAIN TAXA***

Unique record identifier: ***TAXON#.***

Menu Location: ***♦DATA ENTRY♦***

Accessibilty: ***PROGRAMMER and DATA ENTRY.***

The Main Taxon Data entry form is the point of entry of taxonomic information for all taxa. This is the taxonomic information that is then used throughout the database for all listings, subforms and sorts unless otherwise specified. The designation 'MAIN' distinguishes this taxonomy form the Standard taxonomy, which is present in the relation ***STANDARD TAXONOMY***.

A taxon is here defined as the finest identifiable taxonomic level for specimens at a locality. Thus a species is a taxon, but so is a family where that is best level of resolution defined. The finest taxonomic level used in this relation is the species. Finer level divisions, subspecies, are stored, but synonymized to the species entry. Subspecies data is retained in case of future synonymization to full species status, the subspecies assignement is then added in the **TAXA BY LOCALITY** relation in the qualifying fields (section A4.9) of the synonymized species name[11]. In cases where specimens at a single locality are identifiable to both a species and its family (i.e. *Alligator mississippiensis* and Alligatoridae indet. are defined at the same locality) the database will treat these as two seperate taxa present at that locality. This then carries the uncertainity in the Alligatoridae indet. designation, since although the specimens may indeed represent *Alligator mississippiensis*, they could represent another alligatorid. The total number of taxa at a locality thus represents the maximum number of taxa given the specimens present, and is different from the total number of genera or species present.

On entry of the genus name the database automatically searches the **STANDARD TAXONOMY** for the correct higher taxonomy. For information on this standard see section B1.

Using locality occurrence information from the ***TAXA BY LOCALITY*** relation the database automatically calculates ranges and distributional summaries for each taxa and this is presented in the area of the form labeled A2.31.

---

11. The validity of subspecies as a real organic division is considered here to be of uncertain credibility in fossil forms--the recogition of species is questionable enough. However, subspecies data is entered. The method of incorporation described here is based on that suggested by Richard Lupia, who applied it to floral data, which is more susceptible to sub-species taxonomic divisions.

The ***Genus*** and ***species*** fields represent not only the genus and species names belongiing to a specified taxon, but are also used where the taxon in question is described as Family indet., or subclass indet etc., (viz., Mammalia indet., Alligatoridae indet.). In such cases the ***Genus*** field becomes the hierachical name, such as "Alligatoridae" or "Mammalia", and the ***species*** field will contain the entry "indet."

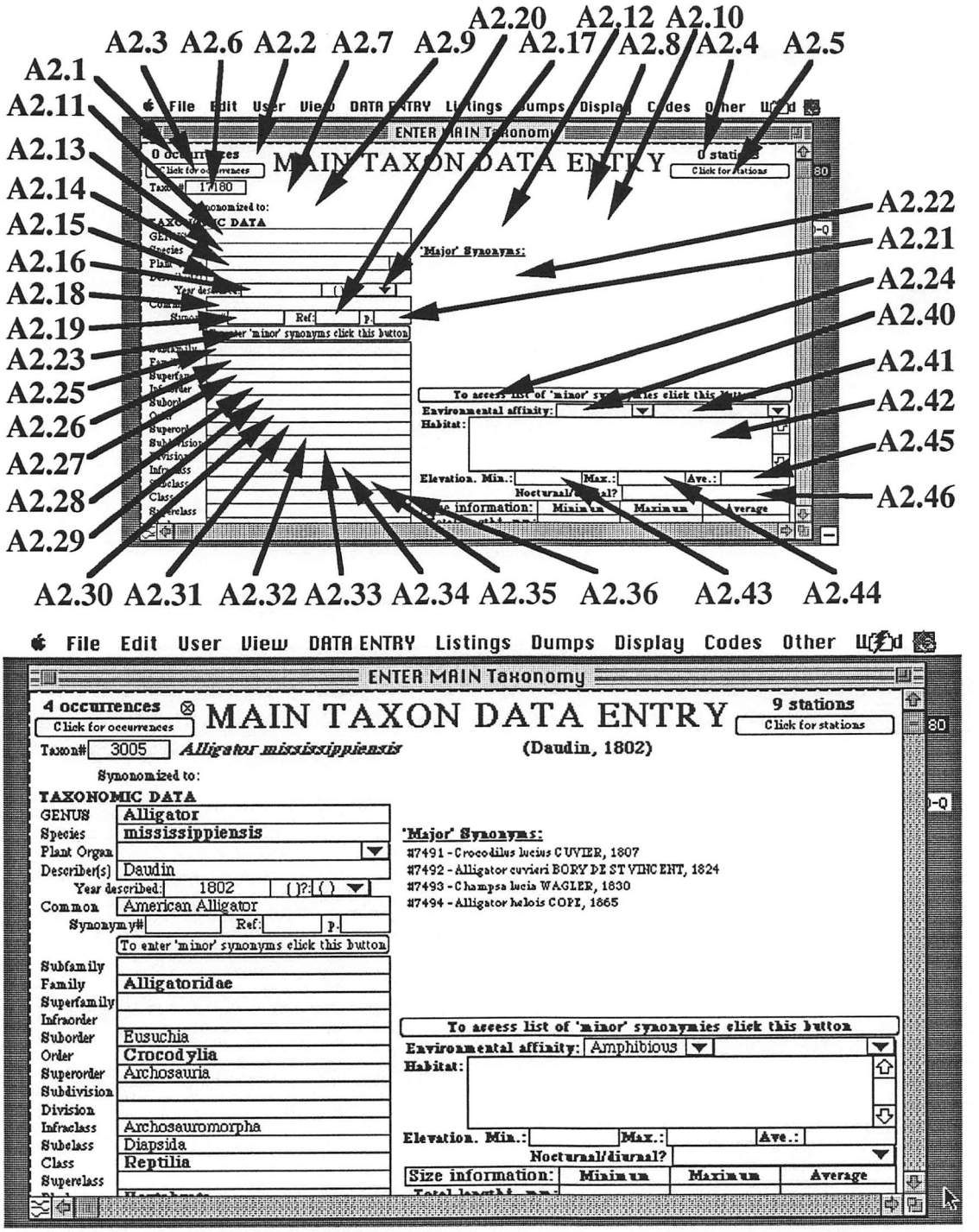

FIGURE A4.04. Screen pictures of the principal entry form in the 'Main Taxonomy' relation.

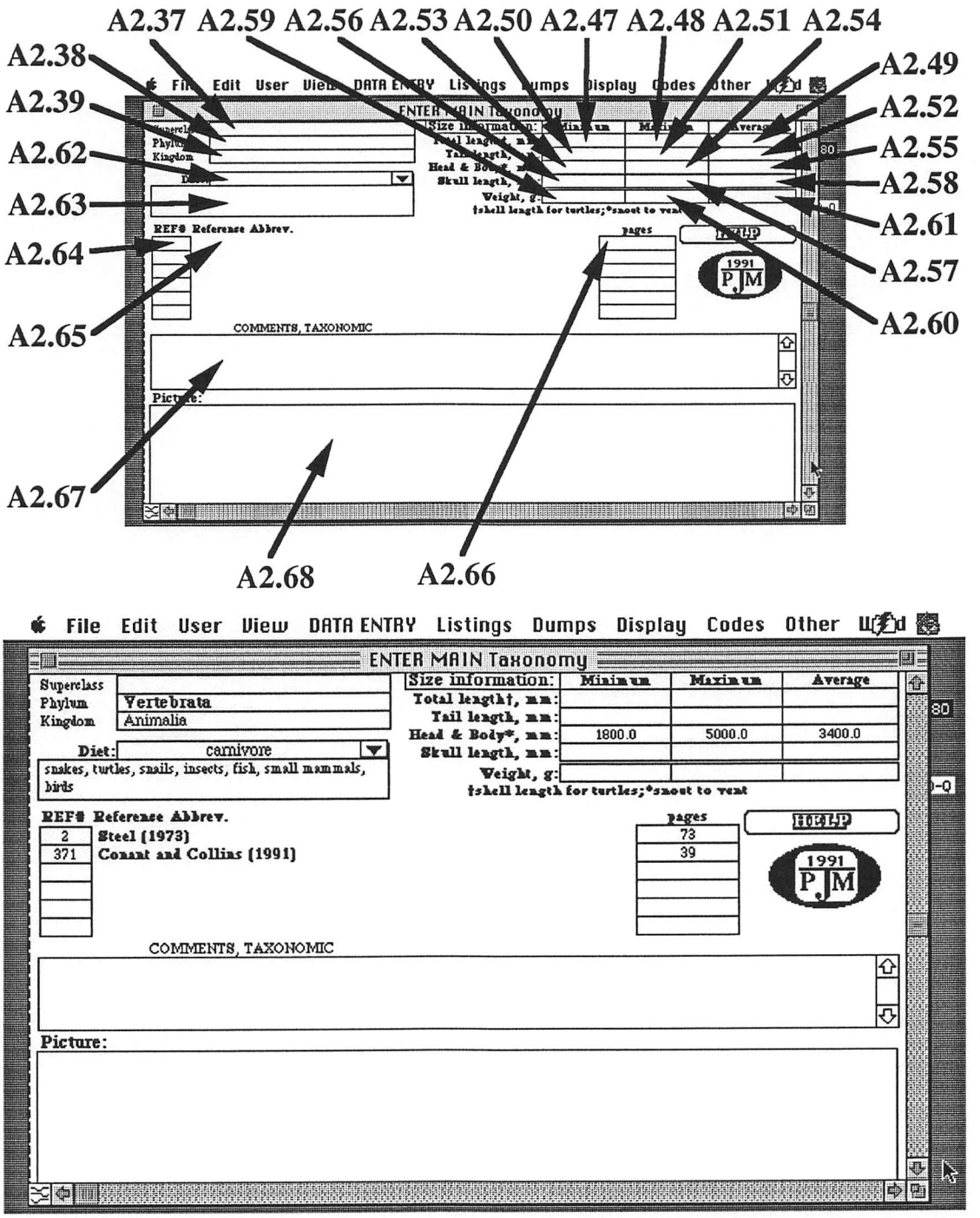

FIGURE A4.04., continued.

A2.1. *Number of Occurrences*

Internal name: If sub-count=1? (abacus)

Nature: Calculated
Type: n/a
Values: n/a

Description: This number represents a count of the number of records in the ***MAIN TAXA BY LOCALITY*** relation which contain the taxon described in this taxon record (the number of occurrences of the taxon). This value is not stored in a field, such that it will change to reflect additions to the list of occurrences.

A2.2. *Extinct or extant?*

Internal name: Taxa extant? (abacus)

Nature: Calculated
Type: Text (symbol)
Values: † or ✷, for extinct and extant espectively

Description: This abacus examines the occurrence records of the taxon in the ***MAIN TAXA BY LOCALITY*** relation, to determine whether the taxon is extant or extinct.

A2.3. *Click for occurrences* Button

Internal name: n/a

Nature: n/a
Type: Sequence button
Values: n/a

Description: This button accesses a listing of all occurrences of the taxon in question (see Figure A4.05).

A2.4. *Number of Stations*

Internal name: If sub-count=1? (stations) (abacus)

Nature: Calculated
Type: n/a
Values: n/a

Description: This number represents a count of the number of records in the ***CLIMATE STATIONS*** relation which contain the taxon described in this taxon record (the number of

Recent occurrences of the taxon). This value is not stored in a field, such that it will change to reflect additions to the list of occurrences.

A2.5. *Click for stations* Button

Internal name: n/a

Nature: n/a
Type: Sequence button
Values: n/a

Description: This button accesses a listing of all modern climate stations at which the taxon in question is recorded (see Figure A4.05).

A2.6. *Taxon#*

Internal name: Taxon# (Field), #ing (Abacus)

Nature: MANDATORY (Defaulted field)[12]
Type: Number field and abacus
Values: any integer (Default strongly recommended)

Description: This is an arbitrary, but unique, number that the computer uses to facilitate searches and links for taxon records. On the other entry forms this is the number required in fields prefixed by the word **Taxon#**. The computer provides a new number for each new taxon record added.

HELP: Let the computer generate this number. Selectability is maintained in order to facilitate sorting and queries.

A2.7. *Taxon name*

Internal name: Genus/species (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only

Description: The taxon name. Generated by using the name entered in the ***Genus*** field and that entered in the ***Species*** field. This name should like the ***Taxon #*** be unique.

HELP: Computer generated and non-selectable don't worry about this field.

---

12. This is a validated field. It must be defined. If it is not the computer wil make an audible error sound and prevent tabbing to the next field.

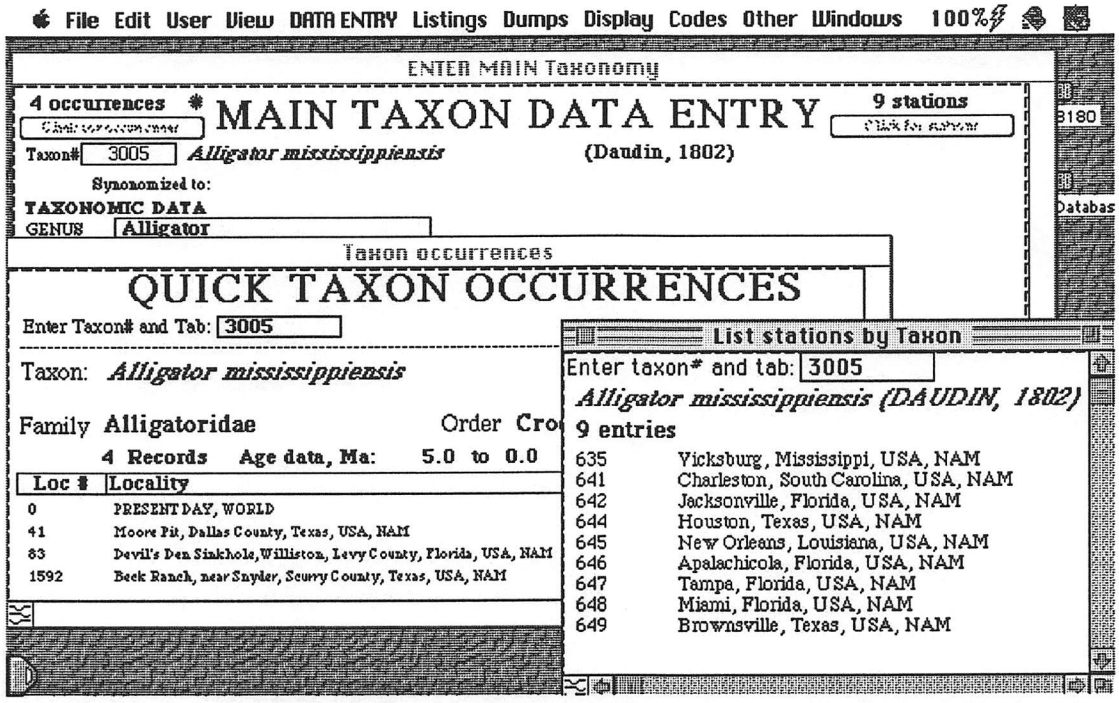

FIGURE A4.05 Fossil occurrences and climate stations for the taxon specified, accessed using the sequence buttons at the top of the MAIN TAXON entry form.

As with all other listings and subforms the choice of fields shown is only limited by the total number of fields in the database (further examples of subforms, searches and listings are given later in this manual). In this case pushing the buttons brings up a subform which requests the taxon number (***Taxon#***) for the taxon of interest. On entry the database accesses the **MAIN TAXA BY LOCALITY** and **TAXA BY CLIMATE STATIONS** relations for fossil and modern occurences, respectively. As set up at present, only the locality or station name is listed. Further information can be obtained by double-clicking on these entries. This will bring up all of the relevant record information as given on the original entry form, in each case.

A2.8. *Describer and year*

Internal name: Describer (year) (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only

Description: The describer and date of the taxon in the ***Taxon name*** field.

A2.9 *Synonymized to*

Internal name: Synonymy Name (Abacus

Nature: Defaulted field
Type: Text abacus
Values: default only

Description: The synonymy taxon of the taxon in the ***Taxon name*** field.

HELP: If the taxon entered in the ***Genus*** and ***species*** fields is synonymized to another taxon name, i.e. that referred to by the Taxon # entered in the ***Synonymy#*** field, the computer will enter that synonymized taxon name in this field. This is automatic so don't worry about this field.

A2.10. *Describer and year for synonymy*

Internal name: Lookup Describer & Year (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only

Description: The describer and date of the synonymized taxon in the ***Synonyomy name*** field.

A2.11. *GENUS*

Internal name: MAIN Genus (Field)

Nature: MANDATORY[13]
Type: Text field

---

13. This is a validated field. It must be defined, if not the computer will beep and prevent tabbing to the next field. A WHY comment is availabale.

Values: any

Description: Genus name. This is also the field for the taxon name for taxon indet., such as Family indet, Subclass indet etc.

HELP: All generic names begin with an upper case letter. On entry the database will write the genus name next to the taxon number at the top of this entry sheet. The database will also use the genus name to lookup the entry in the internal Standard Taxonomy and if found will fill in the higher taxonomic information on this form. This information can be overridden.

A2.12. *Suggested genus synonym (unnamed field)*

Internal name: If standard syn is defined (Abacus)

Nature: Defaulted field
Type: text abacus
Values: Default only

Description: Advisory message.

HELP: If the Standard Taxonomy finds that this genus has been synonymized it will suggest the new genus name on the right of the entry form. Using this information the user should enter the appropriate number in the ***Synonymy #*** field. The message will appear in bold font and read "NOTE: In the standard taxonomy this genus is synonymized to:.[...name...]".

A2.13. *Species*

Internal name: MAIN species (Field)

Nature: Strongly suggested
Type: Text field
Values: any

Description: Species name. For indet taxa, such as Family indet., etc, the word "indet." is entered in this field.

HELP: All species names begin with a lower case letter. If a subspecies is designated put species name followed by subspecies name in this field. The entry from thus field will be written at the top of this entry form following the genus name entered (***Taxon name*** field).

A2.14. *Plant Organ*

Internal name: Plant Organ (Field)

Nature: Optional
Type: Text field (Static pop-up menu)

Values: The following entries are recommended:
foliage
palynomorphs
wood
fruitifications
stems/axes
seeds

Description: The type of plant structure represented by the taxon. Applies to plant material only.

A2.15. *Describer(s)*

Internal name: Describer (Field)

Nature: Optional
Type: Text field
Values: any

Description: The authors attributed to this taxon. This entry will be written on the top right of this form, next to the ***Taxon name.***

HELP: This is the name given along side a taxon name, e.g. *Nannippus beckensis* Dalquest and Donovan, 1973. In this case "Dalquest and Donovan" would be entered in this field. Usually the original describers attributed to a taxon have their names enclose in parenthesis since subsequent revisions will also have names attributed to them. For this see the *()* field.

A2.16. *Year Described*

Internal name: Describer_Year

Nature: Optional
Type: Number field
Values: any integer

Description: The year in which the taxon was first described by the describers entered in the ***Describer(s)*** field. This year will follow the Describers names in the top right of this form.

HELP: e.g., for the taxon *Nannippus beckensis* Dalquest and Donovan, 1973, "1973" would be entered in this field.

A2.17. *()?*

Internal name: (Describer) (Field)

Nature: Optional

Type: Text field (pop-up menu)
Values: two. '()' or undefined

Description: Parenthesis for distinguishing the original describer.

HELP: If the describer information in the reference is in parenthesis chose the brackets from the pop-up menu. This will appear in the top right of the form around the describer name and year). If not leave this blank. E.g. for the taxon *Nannippus minor* (Sellards, 1916), the *()?* field should be defined.

A2.18. *Common*

Internal name: Common_Name (Field)

Nature: Optional
Type: Text field
Values: any

Description: Common name of taxon.

HELP: e.g. the turtle *Caretta caretta* (linnaeus, 1758) is commonly known as the Loggerhead Turtle. In this case "Loggerhead Turtle" should be entered in this field.

A2.19. *Synonymy#*

Internal name: MAIN_synonymy_# (Field)

Nature: Optional
Type: Number field
Values: any integer (applicable Taxon#)

Description: The taxon number of the taxon to which the taxon entered above is to be synonymized to. On entry the name of the taxon synonymized to will be written at the top of the form next to the heading '**Synonymized to:**'

HELP: Use the **LIST TAXA** listing from the ♦**LISTINGS**♦ menu to help find the taxon # you need. E.g. if the taxon *Panthera atrox* (Taxon# 5579) is synonymized to *Felis atrox* (Taxon# 3181), then on the record for *Panthera atrox* enter the Taxon# 3181 in this field.

A2.20. *Ref Synonymy*

Internal name: MAIN_synonymy_# (Field)

Nature: Optional
Type: Number field
Values: any integer (appropriate Ref#)

Description: The reference number appropriate to the reference in the ***MAIN REFERENCES*** relation in which the synonymy is recognized

HELP: Use the **LIST REFERENCES** listing from the **♦LISTINGS♦** menu to help find the Ref # you need.

A2.21. *Ref Synonymy page#'s*

Internal name: Ref synonymy page#'s (Field)

Nature: Optional
Type: Text field
Values: any

Description: The page number(s) for the reference in which the synonymy is recognized.

A2.22. *'Major' Synonyms* Listing

Internal name: n/a

Nature: n/a
Type: Subform
Values: n/a

Description: This subform listing shows all synonymies for the taxon, as included in the database.

A2.23. *To enter 'minor' synonymys click this button* Button

Internal name: n/a

Nature: n/a
Type: Sequence button
Values: n/a

Description: This button accesses the entry form for 'minor' synonyms (see Section B7). 'Minor' in this case means all synonyms that have been suggested for this taxon but that are not necessarily those adopted here. This entry form is simply for record keeping.

A2.24. *To access list of 'minor' synonymies click this button* Button

Internal name: n/a

Nature: n/a
Type: Sequence button
Values: n/a

Description: This button accesses a listing of all 'minor' synonyms for this taxon. These synonyms are for record keeping only and at this stage are not utilized by the database in anyway.

A2.25. *Subfamily*

Internal name: MAIN_Subfamily (Field), Find_Standard_Subfamily (Abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Subfamily name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: The computer should define this field automatically on the basis of the standard taxonomy. If the taxonomy is not defined check that the genus entered in the ***Genus*** field is listed in the Standard Taxonomy by accessing the listing **STANDARD TAXON LIST** in the **♦LISTING♦** menu. If it is not it is recommended that the user enter the details in the standard taxonomy using the **ENTER STANDARD TAXONOMY** entry form under the **♦DATA ENTRY♦** menu.

A2.26. *Family*

Internal name: MAIN_Family (field), Find_Standard_Family (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Family name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.27. *Superfamily*

Internal name: MAIN_Superfamily (field), Find_Standard_Superfamily (abacus)

Nature: Optional
Type: Text field and abacus

Values: any

Description: Superfamily name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.28. *Infraorder*

Internal name: MAIN_Infraorder (field), Find_Standard_Infraorder (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Infraorder name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.29. *Suborder*

Internal name: MAIN_Suborder (field), Find_Standard_Suborder (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Suborder name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.30. *Order*

Internal name: MAIN_Order (field), Find_Standard_Order (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Order name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.31. *Superorder*

Internal name: MAIN_Superorder (field), Find_Standard_Superorder (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Superorder name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.32. *Subdivision*

Internal name: MAIN_Subdivision (field), Find_Standard_Subdivision (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Subdivision name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.33. *Division*

Internal name: MAIN_Division (field), Find_Standard_Division (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Division name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.34. *Infraclass*

Internal name: MAIN_Infraclass (field), Find_Standard_Infraclass (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Infraclass name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.35. *Subclass*

Internal name: MAIN_Subclass (field), Find_Standard_Subclass (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Subclass name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.36. *Class*

Internal name: MAIN_Class (field), Find_Standard_Class (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Class name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.37. *Superclass*

Internal name: MAIN_Superclass (field), Find_Standard_Superclass (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Superclass name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.38. *Phylum*

Internal name: MAIN_Phylum (field), Find_Standard_Phylum (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Phylum name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.39. *Kingdom*

Internal name: MAIN_Kingdom (field), If_phylum_vertebrata_KDM= (abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: Kingdom name to which the taxon belongs. The default for this field is from the standard taxonomy based on the genus name.

HELP: see HELP for field A2.12

A2.40. *Environmental Affinity*

Internal name: Environmental_affinity (field), Environ._affinity_abacus (abacus)

Nature: Optional (defaulted field)
Type: Text field (static pop-up menu)
Values: Aquatic
Amphibious
Terrestrial
Unspecified

Description: The general environment in which the taxon occurs.

HELP: Assigns a general environmental affinity to the taxon. This allows the faunal list to be used as a check on the environmental description given for the locality in the **ENTER LOCALITY DATA** form. By recording the ratio of Aquatic:Amphibious:Terrestrial gross changes in faunas can be assessed in respect to large scale environmental changes. This ratio is automatically calculated by the computer for each faunal list and is provided on the **TAXA BY LOCALITY** listing (see ♦**DISPLAY**♦ Menu). In terms of controls for paleoclimatically pertinent taxa, the transition to a fully terrestrial fauna will preclude crocodilians say. This absence need not then be climatic.

The following fields are for modern day taxa only. Size information for fossil data should be entered in the ***MAIN TAXA BY LOCALITY*** relation. Habitat and ecological data for fossils is interpretative and is not presently included in this database.

A2.41. *Arboreal/fossorial? (unnamed field)*

Internal name: Arboreal/fossorial? (field)

Nature: Optional
Type: Text field (static pop-up menu)
Values:
aquatic
arboreal
fossorial
semiaquatic
terrestrial
unknown

Description: The general habitat of the taxon.

A2.42. *Habitat*

Internal name: Habitat (Field).

Nature: Optional
Type: Text field (keyword)
Values: any

Description: The habitat appropriate to the taxon.

HELP: This a keyword field. This means that detailed habitat information can be entered but still be rapidly queried. The amount of information that can be entered here is essentially unlimited.

A2.43. *Elevation. Min.*

Internal name: Elevation (minimum) (Field)

Nature: Optional
Type: Number field
Values: any

Description: The minimum elevation occupied by the taxon today.

HELP: This elevation is for the entire range of the taxon and as such is of limited use since elevation limits change with geography as other metris changes (e.g. temperature, vegetation, etc.).

A2.44. *Elevation. Max.*

Internal name: Elevation_(maximum) (Field)

Nature: Optional
Type: Number field
Values: any

Description: The maxmum elevation occupied by the taxon today.

HELP: This elevation is for the entire range of the taxon and as such is of limited use since elevation limits change with geography as other metris changes (e.g. temperature, vegetation, etc.).

A2.45. *Elevation. Ave.*

Internal name: Elevation_(average) (Field), Elevation_average (Abacus)

Nature: Optional (defaulted field)
Type: Number field
Values: any

Description: The average elevation occupied by the taxon today. This is automatically calculated using the minimum and maximum values. Consequently it is better considered a median value rather than an average.

HELP: This elevation is for the entire range of the taxon and as such is of limited use since elevation limits change with geography as other metris changes (e.g. temperature, vegetation, etc.).

A2.46. *Nocturnal/diurnal?*

Internal name: nocturnal/diurnal? (Field)

Nature: Optional
Type: Text field (static popup menu)

Values:
crepuscular
diurnal
nocturnal
undefined
unknown
whenever

Description: The time of day when the taxon is mainly active.

HELP: Crepuscular, evenings and/or early morning -- twilight; diurnal, during the day; nocturnal, at night; whenever, no preference for time of day--there appears to be no formal term for this activity period.

The following fields (A2.47-A2.61) give measurements and masses for taxa. Values are based on the entire range of the taxon. Because, in general, intraspecific size variations are not great compared with overall interspecific size variations, this information is of use for looking at size distributions within faunas, which can, in turn, be used to model taphonomic and collection biases that might apply to fossil assemblages. However, care must be taken in using the 'average' values given; these are better described as the median values, since, in general, they are derived by averaging the minimum and maximum values. All distance measurements (mm) are in millimetres, mass (incorrectly titled as weight on the entry form) values in grams (g).

A2.47. *Total length minimum.*

Internal name: Total_length_Minimum (Field), Tail+Head&body_MIN (Abacus)

Nature: Optional (defaulted field)
Type: Number field
Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The minimum total length of the taxon over it's entire range. By default this field is automatically filled by the sum of the minimum tail and minimum Head and body values.

HELP: The total length is the distance from snout to the tip of the tail.

A2.48. *Total length maximum.*

Internal name: Total_length_Maximum (Field), Tail+Head&body_MAX (Abacus)

Nature: Optional (defaulted field)
Type: Number field
Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The maximum total length of the taxon over it's entire range. By default this field is automatically filled by the sum of the maximum tail and maximum Head and body values.

HELP: The total length is the distance from snout to the tip of the tail.

A2.49. *Total length average.*

Internal name: Total length Average (Field), Average Total length (Abacus)

Nature: Optional (defaulted field)
Type: Number field
Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The average total length of the taxon over it's entire range. By default this field is automatically filled by the average of the minimum and maximum total length values. Consequently this value is more appropriately the median value rather than the average.

HELP: The total length is the distance from snout to the tip of the tail.

A2.50. *Tail length minimum.*

Internal name: Tail length Minimum (Field)

Nature: Optional
Type: Number field
Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The minimum tail length of the taxon over it's entire range.

A2.51. *Tail length maximum.*

Internal name: Tail length Maximum (Field)

Nature: Optional
Type: Number field
Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The maximum tail length of the taxon over it's entire range.

A2.52. *Tail length average.*

Internal name: Tail_length_Average (Field), Average_Tail_length (Abacus)

Nature: Optional (defaulted field)
Type: Number field
Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The average tail length of the taxon over it's entire range. By default this field is automatically filled by the average of the minimum and maximum tail length values. Consequently this value is more appropriately the median value rather than the average.

A2.53. *Head+Body length Minimum.*

Internal name: Head+Body_length_Minimum (Field)

Nature: Optional
Type: Number field
Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The minimum head+body length of the taxon over it's entire range.

HELP: The head+body length is the distance from the animal's snout to it's vent.

A2.54. *Head+Body length Maximum.*

Internal name: Head+Body_length_Maximum (Field)

Nature: Optional
Type: Number field
Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The maximum head+body length of the taxon over it's entire range.

HELP: The head+body length is the distance from the animal's snout to it's vent.

A2.55. *Head+Body length average.*

Internal name: Head+Body_length_Average (Field), Average_Head+Body_length (Abacus)

Nature: Optional (defaulted field)
Type: Number field

Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The average head+body length of the taxon over it's entire range. By default this field is automatically filled by the average of the minimum and maximum head+body length values. Consequently this value is more appropriately the median value rather than the average.

HELP: The head+body length is the distance from the animal's snout to it's vent.

A2.56. *Skull length Minimum.*

Internal name: Skull_length_Minimum (Field)

Nature: Optional
Type: Number field
Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The minimum skull length of the taxon over it's entire range.

A2.57. *Skull length Maximum.*

Internal name: Skull_length_Maximum (Field), Default_length_Max_skull (Abacus)

Nature: Optional (defaulted field)
Type: Number field
Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The maximum skull length of the taxon over it's entire range. The default for this field is the minimum skull length value.

A2.58. *Skull length average.*

Internal name: Skull_length_Average (Field), Average_Skull_length (Abacus)

Nature: Optional (defaulted field)
Type: Number field
Values: any (all measurements in millimetres, 1 decimal place by default)

Description: The average skull length of the taxon over it's entire range. By default this field is automatically filled by the average of the minimum and maximum skull length values. Consequently this value is more appropriately the median value rather than the average.

A2.59. *Weight, minimum.*

Internal name: Weight (g) Minimum (Field)

Nature: Optional
Type: Number field
Values: any (all measurements in grams, 1 decimal place by default)

Description: The minimum weight of the taxon over it's entire range.

HELP: Mass can be calculated from this value.

A2.60. *Weight, maximum.*

Internal name: Weight (g) Maximum (Field), Default for weight (Abacus)

Nature: Optional (defaulted field)
Type: Number field
Values: any (all measurements in grams, 1 decimal place by default)

Description: The maximum weight of the taxon over it's entire range. The default for this field is the minimum weight value.

HELP: Mass can be calculated from this value.

A2.61. *Weight, average.*

Internal name: Weight (g) Average (Field), Weight Average (Abacus)

Nature: Optional (defaulted field)
Type: Number field
Values: any (all measurements in grams, 1 decimal place by default)

Description: The average weight of the taxon over it's entire range. By default this field is automatically filled by the average of the minimum and maximum weight values. Consequently this value is more appropriately the median value rather than the average.

HELP: Mass can be calculated from this value.

A2.62. *Diet*

Internal name: Diet? (Field)

Nature: Optional
Type: Text field (static popup menu)
Values: carnivore
frugivore
herbivore
insectivore
nectarivore
omnivore
piscivore
unknown

Description: The principal diet of the taxon.

A2.63. *Diet-comments*

Internal name: Diet-comments (Field)

Nature: Optional
Type: Text field (keyword)
Values: any

Description: The detailed diet of the taxon.

HELP: This field allows the details of the taxon's diet to be entered, e.g., "snakes, turtles, snails..." As a keyword field searches on this field are more or less instantaneous, such that all taxa which eat a particular food may be found rapidly.

A2.64. *REF#1*

Internal name: REF#A (Field)

Nature: Optional
Type: Number field
Values: any

Description: The reference number of the reference used in providing the taxonomic data. If the taxonomic data was the default the reference need not be stated since it will be assumed to be that used in the standard taxonomy.

HELP: E.g. if the reference used is Graham, 1987 (REF#1252) enter "1252" in this field.

A2.65. *Reference Abbrev.1*

Internal name: Find_Ref_Name_for_REF#A (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only (calculated field)

Description: The reference abbreviation for the Reference number specified in the **REF#** field.

HELP: Don't worry about this field, the computer fills in this field automatically based upon the ***REF#*** entered.

A2.66. *REF#A, pages*

Internal name: REF#A._pages (Field)

Nature: Optional
Type: Text field
Values: any

Description: The pages from which the data is derived.

Space for six seperate references is provided. The format is the same in each case. Each is distinguished with a different number or letter. Thus, the second reference number field (labeled **REF#**) has the field name REF#B, the third REF#C, and so on.

A2.67. *Comments, Taxonomy*

Internal name: Comments._Taxonomic (Field)

Nature: Optional
Type: Text field
Values: any

Description: For comments pertaining to this entry form

A2.68. *Picture*

Internal name: Picture

Nature: Optional
Type: Picture field
Values: any

Description: For any picture pertaining to this taxon. Scanned images may be placed in this field.

A3. ENTER LOCALITIES

Relation: ***MAIN LOCALITIES***

Unique record identifier: ***LOCALITY#***

Menu Location: ***♦DATA ENTRY♦***

Accessibilty: ***PROGRAMMER and DATA ENTRY***

The **ENTER Localities** form is the entry point for all data pertaining to localities including stratigraphic, lithologic and environmental information. Each record represents a 'locality' as described in the literature. However a 'locality' *per se* has no geographic or temporal constraints and so qualifiers are available within the entry form: the age dating and ***Geographic Precision*** fields. The unique identifier for records entered here is the field ***Locality#***. This is also the principle linkage between this relation and others in the collection[14] .

The 'present day' is designated as locality # 0. This is to facilitate range information (see section C).

This entry form contains all information pertaining to a locality that is not specific to the individual taxa that comprise the associated faunal list. This includes the stratigraphic age of the locality, its present geographic location, principle rock types and general environment of deposition. This information has been designed to be in a format compatible with existing databases of the Paleogeographic Atlas Project

14. NOTE there are subforms linked with other fields from this form for instance ***Formation name***

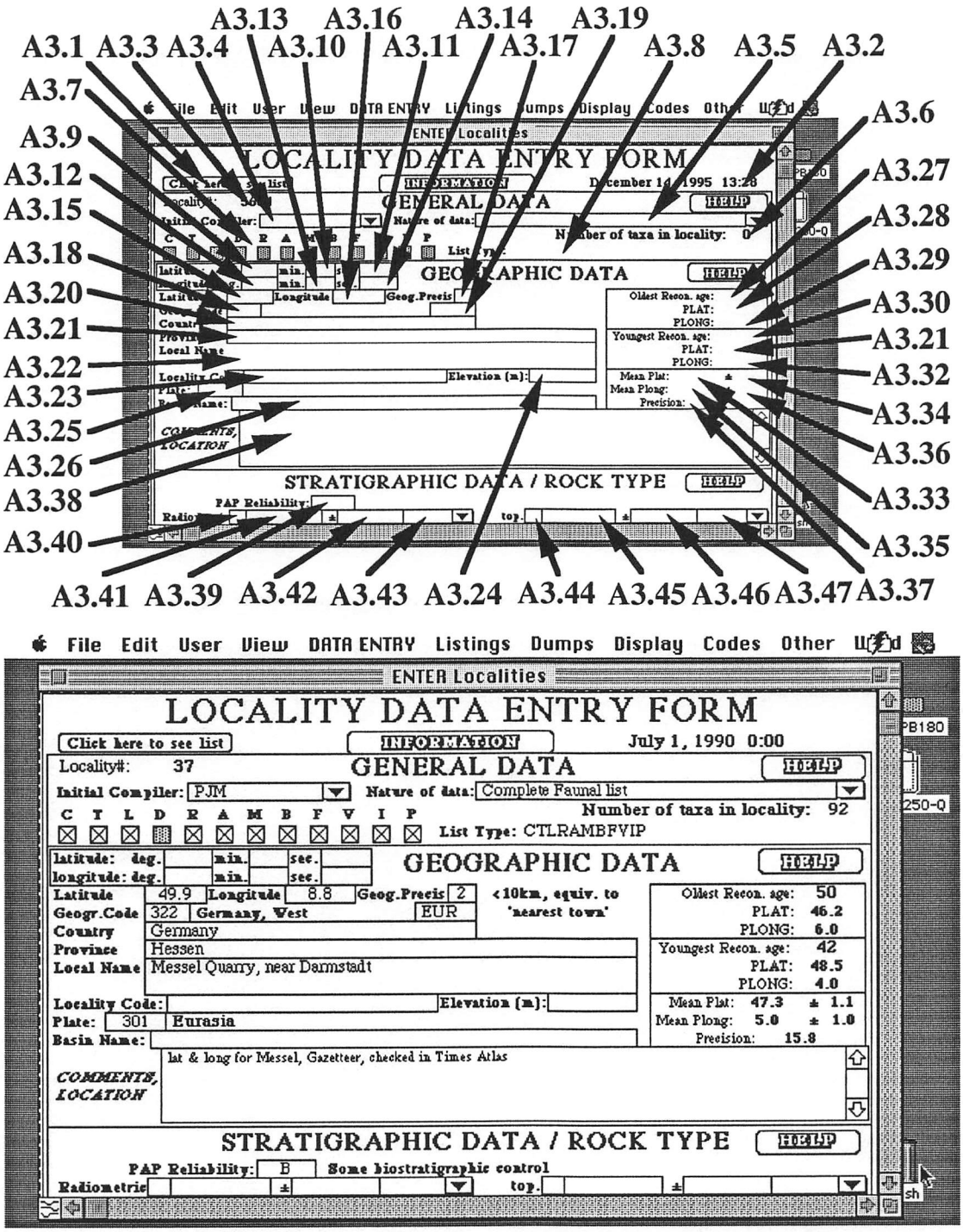

FIGURE A4.06. Screen pictures of the principal entry form in the 'Main Locality' relation.

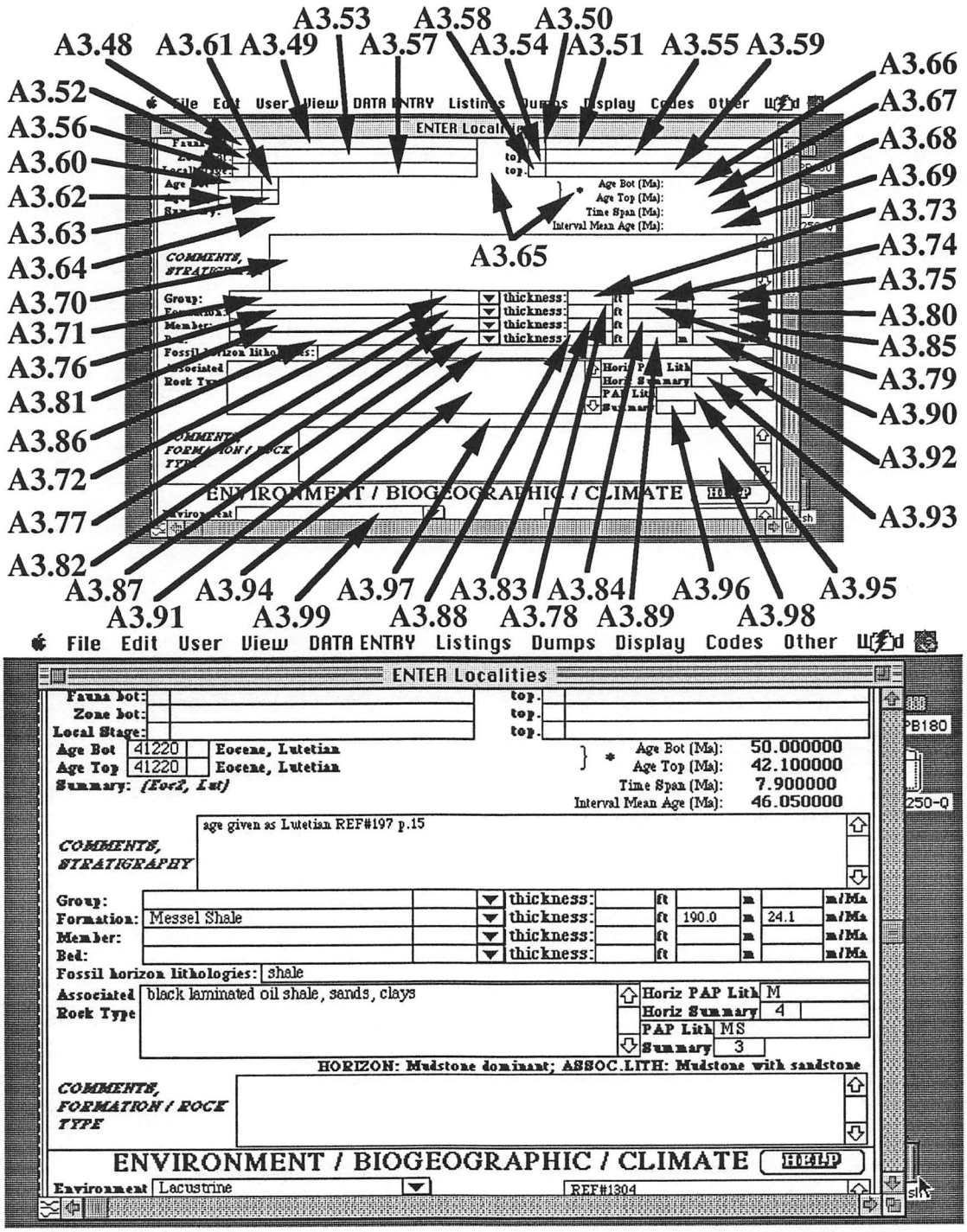

FIGURE A4.06., continued.

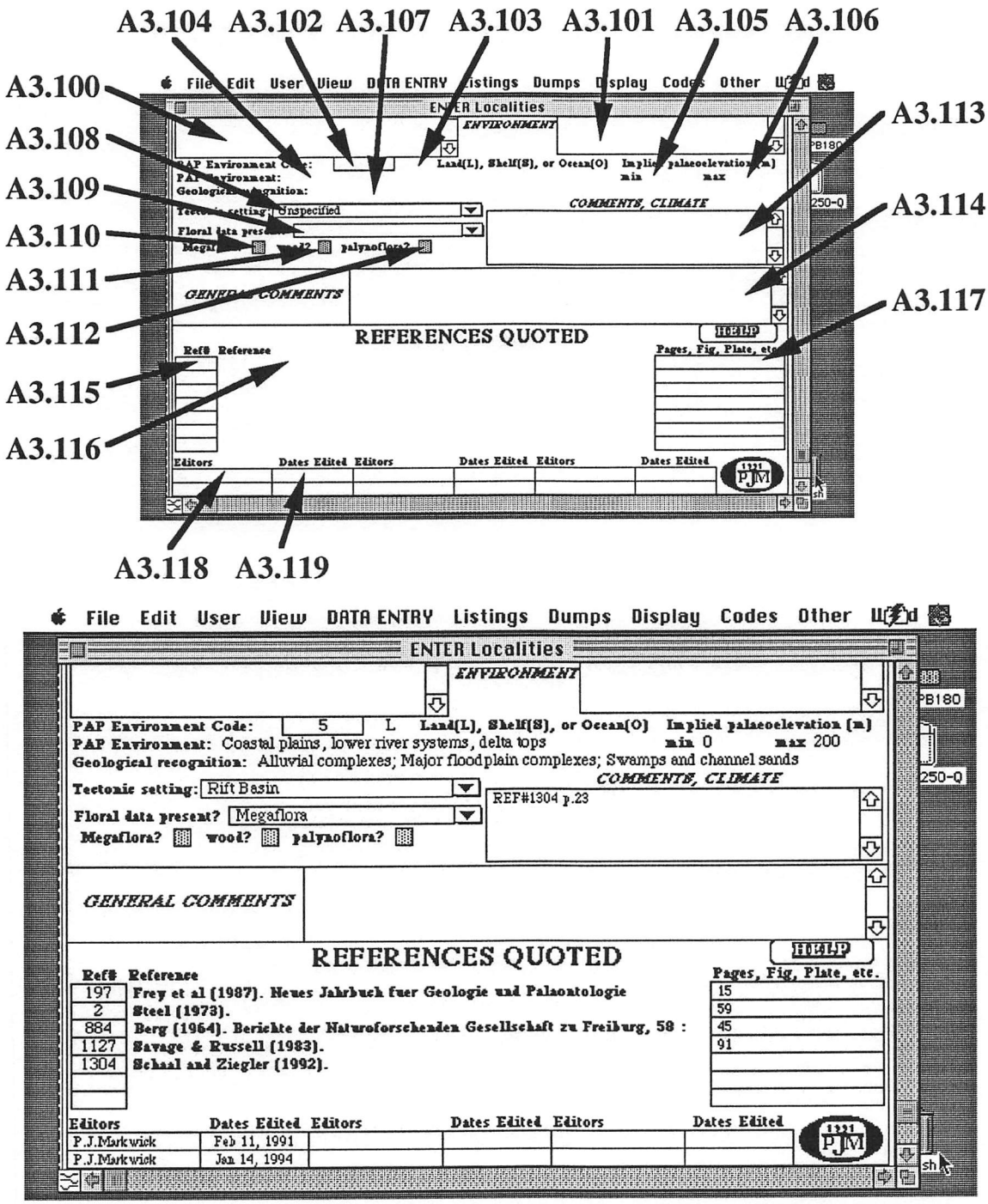

FIGURE A4.06., continued.

GENERAL DATA

A3.1. *Click here to see list* button

Internal name: n/a

Nature: n/a
Type: Sequence button
Values: n/a

Description: This button accesses a listing of all taxa in this locality. Further information for these taxa can be obtained by double-clicking on the relevant taxon entry in the listing. An example of the results of this button are shown in Figure A4.07.

A3.2. *Date entered*

Internal name: Date Entered (field), Today (abacus)

Nature: Defaulted field
Type: Date field and abacus
Values: Any date (the database default is strongly recommended)

Description: This is the date when the record was first created. This field is automatically entered by the database.

HELP: The computer will fill this field for you.

A3.3 *Locality#*

Internal name: Locality# (field), ing# (abacus)

Nature: MANDATORY (Defaulted field)[15]
Type: Number field and abacus
Values: any unique integer (the database default is strongly recommended).

Description: This is an arbitrary, but unique, number that the computer uses to facilitate searches and links for locality records. On the other entry forms this is the number required in fields prefixed by the word 'Loc#'. The computer provides a new number for each new taxon record added.

HELP: Let the computer deal with this field. Selectability is maintained only to facilitate sorts and queries.

---

15. This is a validated field. This field must be defined. The computer will make an audible error if this is not defined.

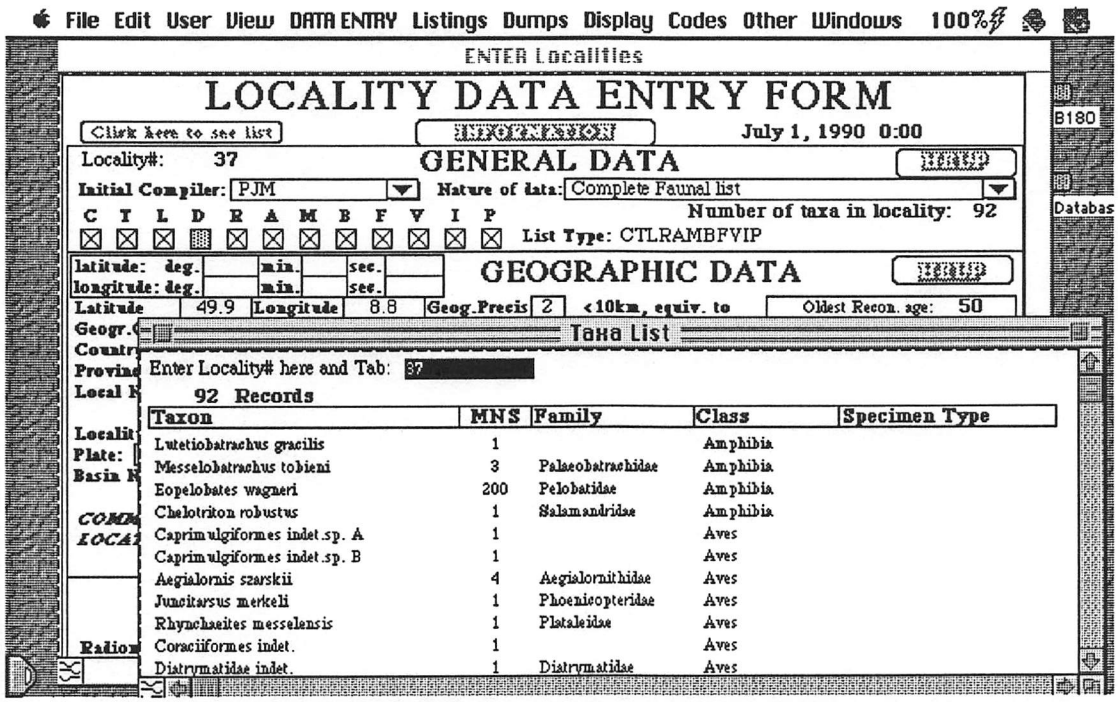

FIGURE A4.07 Fossil occurrences for the locality specified, accessed using the sequence buttons at the top of the MAIN LOCALITY entry form.

As with all other listings and subforms the choice of fields shown is only limited by the total number of fields in the database (further examples of subforms, searches and listings are given later in this manual). In this case pushing the buttons brings up a subform which requests the taxon number (***Locality#***) for the locality of interest. On entry the database accesses the **MAIN TAXA BY LOCALITY** relation for fossil occurences, respectively. As set up at present, this listing only contains the following: Taxon name, MNS (Minimum Number of Specimens represented), Family name, Class name, and what specimens are preserved. Further information can be obtained by double-clicking on these entries. This will bring up all of the relevant record information as given on the original entry form, in each case.

A3.4. *Initial Compiler*

Internal name: Initial Compiler (Field)

Nature: Optional (Keep Value)
Type: Text field
Values: Any

Description: The name of the person who first entered data for this record should be placed here.

HELP: For record keeping. e.g. if the first person to define this record was Paul Markwick, then his name should be entered here, viz., "PJM" or "P.J.Markwick"

A3.5. *Nature of faunal data*

Internal name: Nature of information

Nature: Optional (Strongly Recommended)
Type: Text field (pop-up menu)
Values: pop-up menu only:
?Completeness. Faunal list
Complete faunal list
Complete faunal list (composite)
Incomplete composite faunal list
Incomplete faunal list (crocodilians only)
Incomplete faunal list (herps only)
Incomplete faunal list (mammals only)
Incomplete faunal list (systematics)
Incomplete faunal list (turtles only)
Incomplete faunal list (dinosaurs only)
No faunal list given

Description: Nature of faunal data, whether the list is complete, from a review, or incomplete.

HELP: Vertebrate localities are rarely cited as complete faunal lists. Usually authors will describe particular groups from the locality, especially mammals say. It is therefore important to know this before making interpretations about faunal changes and compositions. The "No faunal list given" may be qualified further by refering to other localities, for instance if the actual list is incorporated in a composite listing, but not broken down into invidual sites then the site record will refer to the composite, "No faunal list given (See LOC#78)" for example.

A3.6. *Number of taxa in locality*

Internal name: Subcount taxa for LOC# (Abacus)

Nature: Defaulted abacus

Type: Number abacus
Values: Any (default only)

Description: The number of taxa occurring at the locality.

HELP: This gives the number of taxa at the locality based on all entries for the locality in the **TAXA BY LOCALITY** relation.

A3.7. *Data Type*

This covers 12 fields that provide information as to which type of data is included for the locality, crocodilians, turtles, invertebrates, etc.

Internal names: Type T (Field); Type L (Field); Type D (Field); Type R (Field), Type R defined if (Abacus); Type A (Field); Type M (Field); Type B (Field); Type F (Field); Type V (Field), Type V defined if (Abacus); Type I (Field); Type P (Field);

Nature: Optional
Type: Flag field (check box)
Values: "Yes" (box checked), "No" (unchecked)

Description: These fields provide a quick way of assessing the fuanl information represented for the locality. The letter codes are as follows:

C = crocodilians (Crocodylia) present
T = turtles (Chelonia) present
L = lepidosaurs (e.g. squamates) present
A = amphibians present
D = dinosaurs present
R = reptiles present
M = mammals present
B = birds present
F = fish present
V = vertebrates present
I = invertebrates present
P = plants (pollen, wood, megaflora) present

HELP: This field allows localities to be rapidly sorted for particular faunal components. For example if you wish to find all localities with crocodilians, type <Y> in the appropriate field in the **OPEN QUERY**. This then gives a quick synopsis of faunal composition. As a relational database, this database can do this automatically be examining the records in the **MAIN TAXA BY LOCALITY** relation. This automation will be added in the next version.

A3.8. *List Type*

Internal name: List Type (Field), Vertebrate abbrev present (Abacus)

Nature: Optional (defaulted field)

Type: Text field
Values: the letter codes as shown above.

Description: A summary of the faunal data for this locality, using the entries to the fields shown in A3.7.

GEOGRAPHIC DATA

Data pertinent to the spatial position of the locality record are entered in this part of the form in the following fields.

A3.9. *latitude deg.*

Internal name: Lat Deg (Field)

Nature: Optional
Type: Number field
Values: any integer, range: -90 > x < 90

Description: For the number of degrees of latitude of record. North is positive, south is negative.

HELP: For use when latitude is given in degrees and minutes rather than decimals. The database will take this value together with the latitude minutes value and calculate the decimal equivalent which will be entered automatically in the ***Latitude*** field below. E.g. if a locality lies at 34°18'N, 102°24'W enter "34" in this field.

A3.10. *latitude min.*

Internal name: Lat Min (Field)

Nature: Optional
Type: Number field
Values: any integer, range: -60 > x < 60

Description: For the number of minutes of latitude of record. North is positive south is negative.

HELP: For use when latitude is given in degrees and minutes rather than decimals. The database will take this value together with the latitude degrees value and calculate the decimal equivalent which will be entered automatically in the ***Latitude*** field below. E.g. if a locality lies at 34°18'N, 102°24'W enter "18" in this field.

A3.11. *latitude sec.*

Internal name: Lat_sec (Field), default_latitude_seconds (Abacus)

Nature: Optional
Type: Number field
Values: any integer, range: -60 > x < 60

Description: For the number of seconds of latitude of record. North is positive south is negative. If the number of degrees of latitude is entered this field automatically defaults to "0" until changed.

HELP: For use when latitude is given in degrees, minutes and seconds rather than decimals.

A3.12. *longitude deg.*

Internal name: Long_deg (Field)

Nature: Optional
Type: Number field
Values: any integer, range: -180 > x < 180

Description: For the number of degrees of longitude of record. East is positive west is negative.

HELP: For use when longitude is given in degrees and minutes rather than decimals. The database will take this value together with the longitude minutes value and calculate the decimal equivalent which will be entered automatically in the ***Longitude*** field below. E.g. if a locality lies at 34°18'N, 102°24'W enter "-102" in this field.

A3.13. *longitude min.*

Internal name: Long_min (Field)

Nature: Optional
Type: Number field
Values: any integer, range: -60 > x < 60

Description: For the number of minutes of longitude of record. East is positive west is negative.

HELP: For use when longitude is given in degrees and minutes rather than decimals. The database will take this value together with the longitude degrees value and calculate the decimal equivalent which will be entered automatically in the ***Longitude*** field below. E.g. if a locality lies at 34°18'N, 102°24'W enter "-24" in this field.

A3.14. *longitude sec.*

Internal name: Long_Sec (Field), default_longitude_seconds (Abacus)

Nature: Optional
Type: Number field
Values: any integer, range: -60 > x < 60

Description: For the number of seconds of longitude of locality. North is positive south is negative. If the number of degrees of longitude is entered (A3.12), this field automatically defaults to "0" until changed.

HELP: For use when longitude is given in degrees, minutes and seconds rather than decimals.

A3.15. *Latitude*

Internal name: Latitude (field), Degs_to_dec_(latitude) (abacus)

Nature: MANDATORY[16]
Type: Number field and abacus
Values: any real number (1 decimal place), range: -90.0 > x < 90.0

Description: For the number of degrees of latitude of record. North is positive south is negative. If latitude deg., and latitude min. fields are defined then the ***Latitude*** field will automatically be defined. The use of decimals reflects the fact that most mapping programs use decimals in preference to degrees, minutes, and seconds.

HELP: e.g., if the locality lies at 34.3°N, 102.4°W then enter "34.3" in this field

A3.16. *Longitude*

Internal name: Longitude (field), Degs_to_dec_(longitude) (abacus)

Nature: MANDATORY[17]
Type: Number field and abacus
Values: any real number (1 decimal place), range: -180.0 > x < 180.0

Description: For the number of degrees of longitude of record. East is positive west is negative. If longitude deg., and longitude min. fields are defined then the ***Longitude*** field will automatically be defined.

---

16. This is a validated field. This field must be defined and lie within the range -90 to 90. If it does not satisfy this criterion an audible error will be automatically produced by the computer.

17. This is a validated field. This field must be defined and lie within the range -180 to 180. If this criterion is not satisfied an audible error will be produced by the computer.

HELP: e.g., if the locality lies at 34.3°N, 102.4°W then enter "-102.4" in this field

A3.17. *Geog. Precis.*

Internal name: Geographic Precision (Field)

Nature: Optional (Recommended)
Type: Number field
Values: any integer, range: $1 \geq x \leq 5$
1 = <1km equiv. to site
2 = <10km equiv. to nearest town
3 = <100km equiv. to US county
4 = <500km equiv. to US state
5 = >500km equiv. to country

Description: Arbitrary number which defines the precision with which the record is located geographically. On input the meaning of the number is written automatically by the computer next to this field. The description of the codes is available in the ♦**CODES**♦ Menu.

HELP: If for instance a locality is described as being 5 km northwest of the town of Worthing, England, and used the latitude and longitude of Worthing to place the locality you would enter "2" in this field. If however the locality was simply described as 'India', then you would be forced to enter "5" in this field. If in doubt use the coarser scale.

A3.18. *Geog. Code*

Internal name: Area Code (Field)

Nature: Optional
Type: Number field
Values: 3-digit integer assigned see listing section D1

Description: A 3-digit number that specifies a geographic region as used in all PAP databases. A listing is available under the ♦**CODES MENU**♦ and in section D1. On entry the full name of the region is automatically written next to this field (Lookup Area Code abacus).

HELP: The rationale for using number codes is that such code is easier for the computer to search for or sort than a long character string such as the name of region. Also the codes used are designed such that all areas within a particular region will have similar numbers so that searching on broader geographic scales can be made, e.g. all European countries have codes beginning with '3', hence Italy is 325 and England is 312. With the available of more powerful computers the need for number codes is becoming less critical to faciliate operating speed. Future versions of the database will probably not utilize them, except to faciliate consistency with the databases and computer programs of the Paleogeographic Atlas Project, University of Chicago.

* * * * * *

NOTE: the database is designed to recognize some errors in assignments of latitudes and longitudes, geographic codes and continental assignments. For instance if a North American geographic code is entered but the longitude entered is positive (east) rather than negative (west)[18] then an error will appear to notify the user.

* * * * * *

A3.19. *Continent* (Unnamed field)

Internal name: xContinent Code (field), If xcont is (abacus)

Nature: Optional (Defaulted field)
Type: TEXT field and abacus
Values: 3-letter abbreviation: AFR, ANT, AUS, ASIA, EUR, IND, NAM, SAM,

Description: A 3-letter abbreviation for the present day geographic continent within which the locality occurs. The computer will automatically enter the appropriate code in this field based on the Geographic code entered in the ***Geog. Code*** field (A3.15). The following list gives the full names for each abbreviation:

AFR - Africa
ANT - Antarctica
AUS - Australia
ASIA - Australasia
EUR - Europe
IND - Indian subcontinent
NAM - North America
PAC - Pacifica
SAM - South America

HELP: There should be no need to worry about this field as the computer is designed to automatically select the correct continent assignment on the basis of the entry in the ***Geog. code*** field.

A3.20. *Country*

Internal name: Country (Field), Lookup country for code# (Abacus)

Nature: Optional (defaulted field)
Type: Text field
Values: any

Description: The political country in which the locality occurs. The database will automatically define this field based on the geographic code entered (A3.18).

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18. A common mistake which can cause apparent major palaeobiogeographic headaches.

HELP: E.g. "England", "Italy", "USA". As of July, 1993 the term "USSR" is still used although this will be corrected in respect of recent events in the next version. In some cases, for instance "United Kingdom" there are a variety of terms that fit the description country. At present the finest unit is used hence "England", "Scotland", "Wales", and "Northern Ireland", although strictly speaking they are all one country.

A3.21. *Province*

Internal name: Province/State (Field), Lookup state/province for code# (Abacus).

Nature: Optional (defaulted field)
Type: Text field
Values: any

Description: The political province or state in which the locality occurs. The database will automatically define this field based on the geographic code entered (A3.18).

HELP: This includes counties in the British sense, e.g. "Sussex", "Yorkshire", and state names in the American sense, e.g. "Illinois", "California". American counties should be included in the locality name.

A3.22. *Local Name*

Internal name: Local Name (Field)

Nature: MANDATORY[19]
Type: Text field (Keyword)
Values: any

Description: The locality name as used in the text referenced.

HELP: The finest geographic breakdown should be written first followed by qualifiers such as 'near Chicago', or 'between....'. Finer political regions than entered in the Province field may be entered after the local name. If the locality is the province name then the province name should appear as both the Locality Name and the Province name. E.g. "Hereford Dump, near Hereford, Deaf Smith County". Entries such as "12 miles from" or "the hill near the road, next to the mad cow with gout" may also be included because as a keyword field the database can readily differentiate and search for terms embedded within text in this field.

A3.23. *Locality Code*

19. This is a validated field. It must be defined. If it is not an audible error will be generated by the computer and continuation to the next field precluded until the criteria are met.

Internal name: Locality Code (Field)

Nature: Optional
Type: Text field
Values: any

Description: Museum locality codes where appropriate. If the locality is a type then write 'Type' in this field.

A3.24. *Elevation (m)*

Internal name: Plate ID

Nature: Optional
Type: Number field
Values: any

Description: The present day elevation of the locality in metres.

A3.25. *Plate*

Internal name: Plate ID (Field)

Nature: Optional (recommended)
Type: Number field
Values: 3-digit integer. values listed in sections D4 and D5.

Description: The 3-digit code appropriate to the tectonic plate upon which the locality is situated. The full name of the plate will be automatically written next to this field on the 3-digit code being entered.

HELP: Consult the listing under the menu ♦**CODES MENU**♦, or the listings and maps given in sections D4 and D5.

A3.26. *Basin Name*

Internal name: Basin Name (Field)

Nature: Optional
Type: Text field
Values: any

Description: The name of the geologic depositional basin in which the locality occurs.

A3.27. *Oldest Recon.age*

Internal name: Recon age oldest (field), If round btm = 0 (abacus)

Nature: Optional
Type: Number field and abacus
Values: integer

Description: The oldest reconstruction age used for the age range represented by the locality. Reconstructions are calculated for every 1 ma interval. This number refers to the oldest 1 ma interval used for this locality.

A3.28. *MAX PLAT*[20]

Internal name: Paleo Lat Maximum (field), Plat max if max recon age = 0 (abacus)

Nature: Optional
Type: Number field and abacus
Values: any real number (1 decimal place), range $-90 \geq x \leq 90$

Description: The paleolatitude for the maximum age of the age range represented by the locality.

HELP: The entries to this field are loaded into the respective records after being 'rotated' to their correct paleopositions. Where the age of the locality is Pleistocene or Holocene the computer will by default enter the present latitudes and longitudes in the paleolatitude and longitude fields since no rotation is necessary. To obtain paleolatitude and longitude values access the **MENU FOR EXTERNAL PROGRAMS** from the **♦OTHER♦** menu. Choose the **DUMP TO ROTATE** option. All programs related to the rotation of datapoints are kept at Chicago.

A3.29. *MAX PLONG*[1]

Internal name: Paleo Long Maximum (field), Plong max If max recon age = 0 (abacus)

Nature: Optional
Type: Number field and abacus
Values: any real number (1 decimal place), range $-180 \geq x \leq 180$

Description: The paleolongitude for the oldest age of the age range represented by the locality.

---

20. All palaeolatitude and longitudes are derived externally to the database on a seperate program on the VAX here at Chicago. The relevent data is sumped out of the database and run through this program. On completion the data is then loaded back into the database. The relevant listings are to be found under the OTHER Menu, titled Menu for External Programs.

HELP: See HELP for A3.28.

A3.30. *Youngest Recon.age*

Internal name: Recon age young (field), If round top = 0 (abacus)

Nature: Optional
Type: Number field and abacus
Values: integer

Description: The youngest reconstruction age used for the age range represented by the locality. Reconstructions are calculated for every 1 ma interval. This number refers to the youngest 1 ma interval used for this locality.

A3.31. *MIN PLAT*[1]

Internal name: Paleo Lat Minimum (field), Plat min if min recon age = 0 (abacus)

Nature: Optional
Type: Number field and abacus
Values: any real number (1 decimal place), range $-90 \geq x \leq 90$

Description: The paleolatitude for the minimum age in the age range represented by the locality.

HELP: See HELP for A3.28.

A3.32. *MIN PLONG*[1]

Internal name: Paleo Long Minimum (field), Plong max If min recon age = 0 (abacus)

Nature: Optional
Type: Number field and abacus
Values: any real number (1 decimal place), range $-180 \geq x \leq 180$

Description: The paleolongitude for the minimum age in the age range represented by the locality.

HELP: See HELP for A3.28.

A3.33. *Mean Plat*[1]

Internal name: Average_Plat (field), Average_PaleoLat (abacus)

Nature: Optional
Type: Number field and abacus
Values: any real number (1 decimal place), range $-90 \geq x \leq 90$

Description: The mean paleolatitude for the age range represented by the locality.

HELP: See HELP for A3.28. The computer will also generate an "error" associated with this value which represents the range of values about the mean (abacus, Paleo Lat 'Error')

A3.34. *Paleo Lat 'Error'*

Internal name: Paleo Lat 'Error' (Abacus)

Nature: Default
Type: Number abacus
Values: any

Description: This is the difference between the maximum or minimum paleolatitude of the locality and the mean value.

A3.35. *Mean Plong*[1]

Internal name: Average_Plong (field), Average_PaleoLong (abacus)

Nature: Optional
Type: Number field and abacus
Values: any real number (1 decimal place), range $-180 \geq x \leq 180$

Description: The mean paleolongitude for the age range represented by the locality.

HELP: See HELP for A3.28. The computer will also generate an "error" associated with this value which represents the range of values about the mean (abacus, Paleo Long 'Error')

A3.36. *Paleo Long 'Error'*

Internal name: Paleo Long 'Error' (Abacus)

Nature: Default
Type: Number abacus
Values: any

Description: This is the difference between the maximum or minimum paleolongitude of the locality and the mean value.

A3.37. *Precision*

Internal name: Entry Precision (Abacus)

Nature: Optional (Defaulted field)
Type: Number abacus
Values: real number (default only)

Description: The precision uses the Geographic Precision entered and the length of the time interval represented by the locality to derive a single number that loosely represents the precision in time and space of this locality. This should only be used as a very rough guide to the precision.

A3.38. *Comments, Location*

Internal name: Comments, Location (Field)

Nature: Optional
Type: Text field
Values: any

Description: Comments and notes appropriate to the Geographic Data part of this entry form are entered here.

STRATIGRAPHIC DATA / ROCK TYPE DATA

Data pertinent to the temporal position of the locality record are entered in this part of the form.

A3.39. *PAP reliability*

Internal name: PAP Strat Reliability

Nature: Optional
Type: Text field
Values: specified, options are the letters A - G

Description: An arbitrary letter code which summarizes the basis of the age assignment entered in this section. These codes are used in all PAP databases. On entry of one of these codes the explanation of the code is automatically written in full next to this field (abacus, Find PAP age description). A listing of explanations is given in Section D11.

HELP: see **PAP STRAT RELIABILITY** under the ♦**CODES**♦ menu.

A3.40. *Radiometric bot?*

Internal name: Radiometric_btm? (Field)

Nature: Optional
Type: Text field
Values: any, usually "?"

Description: Qualifies the age given in the next field.

A3.41. *Radiometric bot*

Internal name: Radiometric_btm (Field)

Nature: Optional
Type: Number field (defaults to 6 decimal places)
Values: any (entries are in millions of years)

Description: The radiometric age of the locality in millions of years.

HELP: If an age range is given for radiometric age the oldest value is given here, e.g. "radiometric age of 70.6±.1 to 69.2±.2," the number "70.6" would be entered in this field.

A3.42. *Radiometric ±bot*

Internal name: Radiometric_±btm (Field)

Nature: Optional
Type: Number field (defaults to 6 decimal places)
Values: any (entries are in millions of years)

Description: The error in the radiometric age date.

HELP: If an age range is given for radiometric age the oldest value is given here, e.g. "radiometric age of 70.6±.1 to 69.2±.2," the number ".1" would be entered in this field.

A3.43. *Radiometric type bot*

Internal name: Radiometric_type_btm (Field)

Nature: Optional
Type: Text field (static popup menu
Values: any, the menu provides the following:

Ar/Ar
C14
K/Ar
U/Pb

Description: The radiometric dating method used.

A3.44. *Radiometric top?*

Internal name: Radiometric_top? (Field), If_bot_?Radiometric_defined (Abacus)

Nature: Optional (defaulted)
Type: Text field
Values: any, usually "?"

Description: Qualifies the age given in the next field. The database will automatically enter the value entered in the bottom age field (A3.41).

A3.45. *Radiometric top*

Internal name: Radiometric_top(Field), If_bot_radiometric (Abacus)

Nature: Optional (defaulted)
Type: Number field (defaults to 6 decimal places)
Values: any (entries are in millions of years)

Description: The radiometric age of the locality in millions of years.

HELP: If an age range is given for radiometric age the youngest value is given here, e.g. "radiometric age of 70.6±.1 to 69.2±.2," the number "69.2" would be entered in this field.

A3.46. *Radiometric ±top*

Internal name: Radiometric_±top (Field), If_±bot_radiometric (Abacus)

Nature: Optional (defaulted)
Type: Number field (defaults to 6 decimal places)
Values: any (entries are in millions of years)

Description: The error in the radiometric age date.

HELP: If an age range is given for radiometric age the youngest error value is given here, e.g. "radiometric age of 70.6±.1 to 69.2±.2," the number ".2" would be entered in this field.

A3.47. *Radiometric type top*

Internal name: Radiometric_type_top (Field), If_bot_radiometric_type (Abacus)

Nature: Optional (defaulted)
Type: Text field (static popup menu)
Values: any, the menu provides the following:
Ar/Ar
C14
K/Ar
U/Pb

Description: The radiometric dating method used. The database will default to the entry in the bottom type field (A3.43).

A3.48. *Fauna bot?*

Internal name: Fauna_btm? (Field)

Nature: Optional
Type: Text field
Values: any, usually "?"

Description: Qualifies the age given in the next field.

.A3.49. *Fauna bot*

Internal name: Fauna_bottom (field)

Nature: Optional
Type: Text field and abacus
Values: any

Description: The oldest (bottom) fauna name where a range of faunal ages is given.

HELP: The default for this field is what ever is entered in the Fauna top field. If there is uncertainty in the assignment a question mark should be placed in the unnamed field immediately before this field

A3.50. *Fauna top?*

Internal name: Fauna_top? (Field), If_bot_?fauna_defined

Nature: Optional (defaulted)
Type: Text field
Values: any, usually "?"

Description: Qualifies the age given in the next field. The database will default to the entry in the bottom type field (A3.48).

A3.51. *Fauna top*

Internal name: Fauna_top (Field), If_bot_fauna_defined (Abacus)

Nature: Optional (defaulted)
Type: Text field
Values: any

Description: The fauna name if given. Where a range of faunas are supplied the youngest (top) one is entered in this field. If the database recognizes the name the codes for the European marine stage equivalents will automatically be entered into the Age Bot and Age Top fields below. If the database has absolute age assignments for the fauna then an asterisk will appear next to this field to signify the level of chronostratigraphic resolution used. If there is uncertainty in the assignment a question mark should be placed in the unnamed field immediately before this field (field, ? Fauna top). The database will default to the entry in the bottom type field (A3.49).

HELP: The fauna may also include the Local Fauna name, e.g. "Hereford Dump Local Fauna" etc.

A3.52. *Zone bot?*

Internal name: Zone_btm? (Field)

Nature: Optional
Type: Text field
Values: any, usually "?"

Description: Qualifies the age given in the next field.

A3.53. *Zone bot*

Internal name: zone_bottom (field)

Nature: Optional
Type: Text field
Values: any

Description: The oldest (bottom) zone name where a range of zonal ages is given.

HELP: If there is uncertainty in the assignment a question mark should be placed in the unnamed field immediately before this field (field: ? zone bot, abacus: If top zone defined). Where a range of zones are supplied the youngest (top) one is entered in this field. If the database recognizes the name the codes for the European marine stage equivalents will automatically be entered into the Age Bot and Age Top fields below. If the database has absolute age assignments for the zone then an asterisk will appear next to this field to signify the level of chronostratigraphic resolution used.

A3.54. *Zone top?*

Internal name: Zone top? (Field), If bot ?zone defined (Abacus)

Nature: Optional (defaulted)
Type: Text field
Values: any, usually "?"

Description: Qualifies the age given in the next field.

HELP: The default for this field is what ever is entered in the ***Zone bot?*** field.

A3.55. *Zone top*

Internal name: zone top (Field), If bot zone defined (Abacus)

Nature: Optional (defaulted)
Type: Text field
Values: any

Description: The zone name if given.

HELP: The default for this field is what ever is entered in the ***Zone bot*** field.

A3.56. *Local Stage bot?*

Internal name: Local Stage btm? (Field)

Nature: Optional
Type: Text field
Values: any, usually "?"

Description: Qualifies the age given in the next field.

A3.57. *Local Stage bot*

Internal name: local stage bottom (field)

Nature: Optional
Type: Text field and abacus
Values: any

Description: The oldest (bottom) Local Stage name where a range of local stages is given.

HELP: Local stage refers to the local stratigraphic age given for the locality. Included in this category are the local mammal stage names (e.g. the North American Mammal Ages etc.,). Where a range of Local Stage names are supplied the youngest (top) one is entered in this field. If the database recognizes the name the codes for the European marine stage equivalents will automatically be entered into the ***Age Bot*** and ***Age Top*** fields below. If the database has absolute age assignments for the zone then an asterisk will appear next to this field to signify the level of chronostratigraphic resolution used. If there is uncertainty in the assignment a question mark should be placed in the unnamed field immediately before this field (field: **Local Stage bot**).

A3.58. *Local Stage top?*

Internal name: Local Stage top? (Field), If bot ?local stage defined (Abacus)

Nature: Optional
Type: Text field
Values: any, usually "?"

Description: Qualifies the age given in the next field.

A3.59. *Local Stage top*

Internal name: Local Stage top (Field), If bot local stage defined (Abacus)

Nature: Optional (defaulted)
Type: Text field
Values: any

Description: The Local Stage name if given.

HELP: The default for this field is what ever is entered in the ***Local Stage bot*** field.

A3.60. *Age Bot*

Internal name: Age Bottom (field), If zone/Stage BTM find Code (abacus)

Nature: MANDATORY[21]
Type: Number field
Values: a 5-digit code, options are given in Section D6 and D7

Description: The age code for the stratigraphic age representing the bottom of the interval.

HELP: If either the ***Fauna*** , ***Zone*** or ***Local Stage*** fields are defined this field is automatically filled, if not this field should be filled with the 5-digit age code that represents the bottom stratigraphic age of the locality (e.g. 41410 if the bottom age of the locality is given as Aquitanian or early Miocene). These codes are listed under the **CODES** Menu and presented in Section D6 and D7. As with other parts of the database a numeric code is used in order to facilitate more rapid searches and sorts. Based on the code you enter the computer will find the full stratigraphic name and write this in the space to the right of the code entry field (abacus: **Lookup Age Bot Name**). Uncertainty in this age assignment is expressed by placing a question mark in the unnamed field following this field (field: **? Age Btm**). If the age top and age bot ages are entered in reverse order an error message will automatically appear (abacus: **Error for top age order**).

A3.61. ?*Age Bot*

Internal name: **? Age Btm** (field)

Nature: Optional
Type: Text field
Values: any, usually "?"

Description: Qualifies the age given in the preceding field.

A3.62. *Age Top*

Internal name: **Age Top** (field), **If Zone/Stage find TOP Code** (abacus)

Nature: Strongly Recommended
Type: Number field and abacus
Values: a 5-digit code, options are given in Section D6 & D7

Description: The age code for the stratigraphic age representing the top of the interval.

HELP: If either the ***Fauna, Zone*** or ***Local Stage*** fields are defined this field is automatically filled, if not this field should be filled with the 5-digit age code that represents the top (youngest) stratigraphic age of the locality (e.g. 41410 if the bottom age of the locality is given as Aquitanian or early Miocene). These codes are listed under the **CODES** Menu and presented in Section D6 and D7. As with other parts of the database a numeric code is used in order to facilitate more rapid

21. This is a validated field. This field must be defined. If this criterion is not met with the computer will produce an audible error signal and prevent tabbing to subsequent fields.

searches and sorts. Based on the code you enter he computer will find the full stratigraphic name and write this in the space to the right of the code entry field (abacus: Lookup Age Top Name). Uncertainty in this age assignment is expressed by placing a question mark in the unnamed field following this field (field: ? Age top, abacus: If ?top age). If the age top and age bot ages are entered in reverse order an error message will automatically appear (abacus: Error for top age order).

A3.63. *?Age Top*

Internal name: ? Age Top (field)

Nature: Optional
Type: Text field
Values: any, usually "?"

Description: Qualifies the age given in the preceding field.

A3.64. *Age in words*

Internal name: Age in words (Abacus)

Nature: Default only
Type: Text abacus
Values: default only

Description: Gives text description of stratigraphic age based on codes entered in A3.60 ad A3.62.

A3.65. *If age level defined*

The database will place a star (*) next to stratigraphic level for which chronostratigraphic dates are calculated

Internal name: If defined (Abacus), If defined (magneto) (Abacus), If defined (fauna) (Abacus), If defined (zone) (Abacus), If defined (local stage) (Abacus)

Nature: Default only
Type: Text abacus
Values: default only, "*"

Description: Shows which stratigraphic resolution is being used for the locality.

A3.66. *Age Bot (Ma)*

Internal name: Age (Ma) Bottom (Field), If BTM zone or Local Stage AGE (Abacus)

Nature: Defaulted field
Type: Number abacus
Values: Default only (calculated)

Description: The bottom chronostratigraphic age in millions of years. This is automatically calculated by the computer on the basis of the stratigraphic data entered above.

A3.67. *Age Top (Ma)*

Internal name: Age (Ma) Top (Field), IF TOP zone or Local Stage AGE (Abacus)

Nature: Defaulted field
Type: Number abacus
Values: Default only (calculated)

Description: The top chronostratigraphic age in millions of years. This is automatically calculated by the computer on the basis of the stratigraphic data entered above.

A3.68. *Time span (Ma)*

Internal name: Age (Ma) span (Field), Time Span Harland (Abacus)

Nature: Defaulted field
Type: Number abacus
Values: Default only (calculated)

Description: The length of time represented by the stratigraphic age dating of the locality in millions of years. This is automatically calculated by the computer on the basis of the stratigraphic data entered above.

A3.69. *Interval Mean Age (Ma)*

Internal name: Age (Ma) Med Age (Field), Interval Mean Age (Abacus)

Nature: Defaulted field
Type: Number abacus
Values: Default only (calculated)

Description: The age representing the midpoint of the interval in millions of years. This is automatically calculated by the computer on the basis of the stratigraphic data entered above.

A3.70. *Comments, Stratigraphic*

Internal name: Comments, Stratigraphy (Field)

Nature: Optional
Type: Text field
Values: any

Description: Comments applicable to the data entered in the stratigraphic age data section.

A3.71. *Group*

Internal name: Group (Field)

Nature: Optional
Type: Text field
Values: any

Description: The Stratigraphic Group name as given for the locality.

A3.72. *Group part (Unnamed field)*[22]

Internal name: Group part (Field)

Nature: Optional
Type: Text field (pop-up menu)
Values: any. Recommended values:
basal
lower
middle
upper

Description: The part of the Stratigraphic Group as represented by the locality.

A3.73. *Group thickness (feet)*

Internal name: Thickness group -feet (Field)

Nature: Optional
Type: Number field
Values: any integer

22. Unnamed field immediately to the right of the Group field

Description: The thickness of the Group in feet.

HELP: Enter the thickness in metres for the part of the Group specified or for all of the Group if a part is not given. Field on same line as ***Group*** field, located between the headings **thickness** and **ft.** The database will calculate the metric equivalent using the value entered in this field. This will be entered in the field followed by the heading **m.** Using this information the database will automatically calculate an average accumulation rate using the thickness in metres and the interval length of the locality. This will be entered into the field followed by the heading **m/Ma.**

A3.74. *Group thickness (metres)*

Internal name: Thickness group -metres (field), Feet to metres Group (abacus)

Nature: Optional (Defaulted field if ***Group thickness (feet)*** field is defined.
Type: Number field and abacus
Values: any real number (1 decimal place)

Description: The thickness of the Group in metres.

HELP: Enter the thickness in metres for the part of the Group specified, or all of the Group if a part is not given. Field on same line as ***Group*** field immediately before the heading **m.** Using this information the database will automatically calculate an average accumulation rate using the thickness in metres and the interval length of the locality. This will be entered into the field followed by the heading **m/Ma.**

A3.75. *Group average accumulation rate (m/Ma)*

Internal name: Accumulation rate Group (Abacus)

Nature: Optional (Defaulted field if ***Group thickness (feet)*** or ***Group thickness (metres)*** fields are defined.
Type: Number abacus
Values: any real number (1 decimal place) default only

Description: The average accumulation rate of the Group in metres per million years (m/Ma).

HELP: The computer will automatically calculate this based on the thickness data entered for the Group (if specified) and the interval length in millions of years. Field on same line as ***Group*** field, located immediately before the heading **m/Ma.**

A3.76. *Formation*

Internal name: Formation (Field)

Nature: Optional
Type: Text field
Values: any

Description: The Stratigraphic Formation name as given for the locality.

A3.77. *Formation part (Unnamed field)*[23]

Internal name: Fm part (Field)

Nature: Optional
Type: Text field (pop-up menu)
Values: any. Recommended values:
basal
lower
middle
upper

Description: The part of the Stratigraphic Formation as represented by the locality.

A3.78. *Formation thickness (feet)*

Internal name: Thickness formation -feet (Field)

Nature: Optional
Type: Number field
Values: any integer

Description: The thickness of the Formation in feet.

HELP: Field on same line as ***Formation*** field, located between the headings **thickness** and **ft.** The database will calculate the metric equivalent using the value entered in this field. This will be entered in the field followed by the heading **m.** Using this information the database will automatically calculate an average accumulation rate using the thickness in metres and the interval length of the locality. This will be entered into the field followed by the heading **m/Ma.**

A3.79. *Formation thickness (metres)*

Internal name: Thickness formation -metres (field), Feet to metres Formation (abacus)

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23. Unnamed field immediately to the right of the Formation field

Nature: Optional (Defaulted field if ***Formation thickness (feet)*** field is defined.
Type: Number field and abacus
Values: any real number (1 decimal place)

Description: The thickness of the Formation in metres.

HELP: Field on same line as ***Formation*** field immediately before the heading **m**. Using this information the database will automatically calculate an average accumulation rate using the thickness in metres and the interval length of the locality. This will be entered into the field followed by the heading **m/Ma**.

A3.80. *Formation average accumulation rate (m/Ma)*

Internal name: Accumulation_rate_Formation (Abacus)

Nature: Optional (Defaulted field if ***Formation thickness (feet)*** or ***Formation thickness (metres)*** fields are defined.
Type: Number abacus
Values: any real number (1 decimal place) default only

Description: The average accumulation rate of the Formation in metres per million years (m/Ma).

HELP: Field on same line as ***Formation*** field, located immediately before the heading **m/Ma**.

A3.81. *Member*

Internal name: Member (Field)

Nature: Optional
Type: Text field
Values: any

Description: The Stratigraphic Member name as given for the locality.

A3.82. *Member part (Unnamed field)*[24]

Internal name: Mbr_part (Field)

Nature: Optional
Type: Text field (pop-up menu)

---

24. Unnamed field immediately to the right of the Member field

Values: any. Recommended values:
basal
lower
middle
upper

Description: The part of the Stratigraphic Member as represented by the locality.

A3.83. *Member thickness (feet)*

Internal name: Thickness_member_-feet (Field)

Nature: Optional
Type: Number field
Values: any integer

Description: The thickness of the Member in feet.

HELP: Field on same line as ***Member*** field, located between the headings **thickness** and **ft.** The database will calculate the metric equivalent using the value entered in this field. This will be entered in the field followed by the heading **m**. Using this information the database will automatically calculate an average accumulation rate using the thickness in metres and the interval length of the locality. This will be entered into the field followed by the heading **m/Ma.**

A3.84. *Member thickness (metres)*

Internal name: Thickness_member_-metres (field), Feet_to_metres_Member (abacus)

Nature: Optional (Defaulted field if ***Member thickness (feet)*** field is defined).
Type: Number field and abacus
Values: any real number (1 decimal place)

Description: The thickness of the Member in metres.

HELP: Field on same line as ***Member*** field immediately before the heading **m**. Using this information the database will automatically calculate an average accumulation rate using the thickness in metres and the interval length of the locality. This will be entered into the field followed by the heading **m/Ma.**

A3.85. *Member average accumulation rate (m/Ma)*

Internal name: Accumulation_rate_Member (Abacus)

Nature: Optional (Defaulted field if **Member thickness (feet)** or ***Member thickness (metres)*** fields are defined.
Type: Number abacus
Values: any real number (1 decimal place) default only

Description: The average accumulation rate of the Member in metres per million years (m/Ma).

HELP: Field on same line as ***Member*** field, located immediately before the heading **m/Ma.**

A3.86. *Bed*

Internal name: Bed Name (Field)

Nature: Optional
Type: Text field
Values: any

Description: The Stratigraphic Bed name as given for the locality.

A3.87. *Bed part (Unnamed field)*[25]

Internal name: Bed part (Field)

Nature: Optional
Type: Text field (pop-up menu)
Values: any. Recommended values:
basal
lower
middle
upper

Description: The part of the Stratigraphic Bed as represented by the locality.

A3.88. *Bed thickness (feet)*

Internal name: Thickness bed -feet (Field)

Nature: Optional
Type: Number field
Values: any integer

25. Unnamed field immediately to the right of the Bed field

Description: The thickness of the Bed in feet.

HELP: Field on same line as ***Bed*** field, located between the headings **thickness** and **ft.** The database will calculate the metric equivalent using the value entered in this field. This will be entered in the field followed by the heading **m**. Using this information the database will automatically calculate an average accumulation rate using the thickness in metres and the interval length of the locality. This will be entered into the field followed by the heading **m/Ma.**

A3.89. *Bed thickness (metres)*

Internal name: Thickness bed -metres (field), Feet to metres Bed (abacus)

Nature: Optional (Defaulted field if ***Bed thickness (feet)*** field is defined.
Type: Number field and abacus
Values: any real number (1 decimal place)

Description: The thickness of the Bed in metres.

HELP: Field on same line as ***Bed*** field immediately before the heading **m**. Using this information the database will automatically calculate an average accumulation rate using the thickness in metres and the interval length of the locality. This will be entered into the field followed by the heading **m/Ma.**

A3.90. *Bed average accumulation rate (m/Ma)*

Internal name: Accumulation rate Bed (Abacus)

Nature: Optional (Defaulted field if ***Bed thickness (feet)*** or ***Bed thickness (metres)*** fields are defined.
Type: Number abacus
Values: any real number (1 decimal place) default only

Description: The average accumulation rate of the Bed in metres per million years (m/Ma).

HELP: Field on same line as ***Bed*** field, located immediately before the heading **m/Ma.**

A3.91. *Fossil horizon lithologies*

Internal name: Specimen matrix (Field)

Nature: Optional
Type: Text field
Values: any

Description: The lithology of the horizon in which the fossils are found.

A3.92. *Horiz PAP lith*

Internal name: PAP Lith horizon (Field)

Nature: Optional
Type: Text field
Values: any

Description: The lithological codes for the horizon in which the fossils are found. The abbreviated form of the ***Associated rock types*** field using the standardized abbreviations of the Paleogeographic Atlas Project (Ziegler, et al., 1985). See section D9.

HELP: see also **PAP LITHOLOGIES** under the ♦**CODES**♦ menu.

A3.93. *Horizon summary*

Internal name: PAP Lith summ horizon (Field), FIND PAP Lith (horizon) summary code (Abacus)

Nature: Optional
Type: Text field
Values: $1 \leq x \geq 7$. See Section D10

Description: The lithological summary code for the horizon in which the fossils are found. The Paleogeographic Atlas Projects lithological summary codes. See section D10. On entry the explanation of the number is written below this field by the computer (abacus: Lookup PAP Lith summary description)

HELP: see also **PAP LITH SUMMARY** under the ♦**CODES**♦ menu.

A3.94. *Associated rock types*

Internal name: Assoc Rock Types (Field)

Nature: Optional
Type: Text field (Keyword)
Values: any

Description: The rock types represented at the locality

HELP: This field is for storing the lithological data from the locality as a whole and not necessarily the lithology of the fossil-bearing horizons. This field also allows detailed lithological information to be stored, including complete lithologic sections. As a keyword field, queries made on this field can be done on any term embedded in the text.

A3.95. *PAP Lith*

Internal name: PAP Lith Codes (Field)

Nature: Optional
Type: Text field
Values: See Section D9

Description: The abbreviated form of the ***Associated rock types*** field using the standardized abbreviations of the Paleogeographic Atlas Project (Ziegler, et al., 1985). See section D9.

HELP: see also **PAP LITHOLOGIES** under the ♦**CODES**♦ menu.

A3.96. *PAP Lith Summary*

Internal name: PAP Lith Summary Code (Field), FIND PAP Lith Summary code (Abacus)

Nature: Optional
Type: Text field
Values: $1 \leq x \geq 7$. See Section C10

Description: The Paleogeographic Atlas Projects lithological summary codes. See section D10. On entry the explanation of the number is written below this field by the computer (abacus: Lookup PAP Lith summary description)

HELP: see also **PAP LITH SUMMARY** under the ♦**CODES**♦ menu.

A3.97. *Overview of lith data*

Internal name: Horizon summ followed by assoc summ (Abacus)

Nature: Defaulted
Type: Text abacus
Values: Default only

Description: Gives a summary of the PAP lithologic data entered

A3.98. *Comments, Formation / Rock type*

Internal name: Comments, Formation (Field)

Nature: Optional
Type: Text field
Values: any

Description: Comments concerning the Formation and Rock type part of this entry form.

ENVIRONMENT / BIOGEOGRAPHIC / CLIMATE DATA

Data pertinent to the environment and climate of the locality record are entered in this part of the form.

A3.99. *Environment Summary*

Internal name: Environmental_summary (Field)

Nature: Optional
Type: Text field (static pop-up menu)
Values: Recommended values:

Aeolian
Archaeological Site
Cave
Deltaic
Fluvial
Fluvio-lacustrine
Lacustrine
Littoral
Marine
Near shore marine
Paralic
Sinkhole
Tar-pits
Terrestrial indet.
Transition
Unspecified

Description: General environment represented by the locality.

HELP: use the closest environment listed that adequately includes the environment of the locality represented by the record. Choices other than those on the list are permissible, but in order to facilitate searches it is recommended that they be avoided as much as possible.

A3.100. *Environment (Unnamed field)*

Internal name: Environment (Field)

Nature: Optional

Type: Text field (Keyword)
Values: any

Description: Environment. Allows for greater detail than ***Environment Summary*** Field.

A3.101. *Comments, Environment*

Internal name: Comments, Environment (Field)

Nature: Optional
Type: Text field
Values: any

Description: Comments concerning the Environment data entered in the previous fields.

A3.102. *PAP Environmental Code*

Internal name: PAP Environment Code (Field)

Nature: Optional
Type: Number field
Values: $0 \leq x \geq 9$ (see Section D8)

Description: The Environmental codes used by the Paleogeographic Atlas Project (Ziegler, et al., 1985). Note that this was principally established for reconstructing bathymetry and topography for drawing paleogeographic maps. See section D8 for an explanation of each value.

HELP: see also **PAP ENVIRONMENT CODES** under the ♦**CODES**♦ menu.

A3.103. *Land(L), Shelf(S), Ocean(O)*

Internal name: xLand/Shelf/Ocean (field), Shelf/land or deep (abacus)

Nature: Optional (Defaulted field)
Type: Text field and abacus
Values: L, S, or O

Description: A greatly simplified expression of the ***PAP Environmental Code*** Field. The database automatically fills this field on the basis of the entries made in the ***PAP Environmental Code*** Field.

HELP: This breakdown provides a rapid way of sorting for marine and non marine localities. The computer will automatically fill this field.

A3.104. *PAP Environment*

Internal name: If PAP envirn code is ... (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only (See section D8)

Description: On entry of a value in the ***PAP Environment Code*** Field, the explanation is automatically written in this field.

A3.105. *Implied minimum paleoelevation*

Internal name: Implied min palaeoelevation (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only (See section D8)

Description: On entry of a value in the ***PAP Environment Code*** Field, the implied minimum paleoelevation is entered in this field.

A3.106. *Implied maximum paleoelevation*

Internal name: Implied max palaeoelevation (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only (See section D8)

Description: On entry of a value in the ***PAP Environment Code*** Field, the implied maximum paleoelevation is entered in this field.

A3.107. *Geological implications*

Internal name: Geological Prefs of PAP envirn (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only (See section D8)

Description: On entry of a value in the ***PAP Environment Code*** Field, the typical evidence for such environmental PAP codes is shown (see section D8 for details).

A3.108. *Tectonic setting*

Internal name: Tectonic_setting (Field)

Nature: Optional
Type: Text field (static pop-up menu)
Values: any. Recommended values:
Foreland Basin
Intermontane Basin
Passive Margin
Pull-apart Basin
Rift Basin
Stable Craton
Unspecified

Description: The tectonic setting of the locality.

HELP: Use the value that most adequately explains the tectonic setting of the locality at the time that the fauna was deposited. It is strongly recommended that the options listed be used although other entries are permissible.

A3.109. *Floral data present?*

Internal name: Floral_data_present? (Field)

Nature: Optional
Type: Text field (pop-up menu)
Values: any. Recommended values:
flora indet.
leaves
megaflora
microflora
palynomorphs
wood

Description: Nature of any paleobotanical remains at the locality.

HELP: The database was originally constructed with the intention to form a paleofloral database from it. It is now planned to include fossil floras within the vertebrate database itself. This field is intended to keep track of localities where floral data has been recorded in order to check it later.

A3.110. *Megaflora?*

Internal name: Botany_-_megaflora_present (Field)

Nature: Optional

Type: Flag field
Values: "Yes," checked, "No," unchecked

Description: Megaflora present at locality.

A3.111. *wood?*

Internal name: Botany - wood present (Field)

Nature: Optional
Type: Flag field
Values: "Yes," checked, "No," unchecked

Description: Wood present at locality.

A3.112. *palynoflora?*

Internal name: Botany - palynoflora present (Field)

Nature: Optional
Type: Flag field
Values: "Yes," checked, "No," unchecked

Description: Palynoflora present at locality.

A3.113. *Comments, climate*

Internal name: Comments, Climate

Nature: Optional
Type: Text field
Values: any

Description: Comments concerning the climate, tectonic and floral part of this entry form.

A3.114. *General Comments*

Internal name: Comments, General

Nature: Optional
Type: Text field
Values: any

Description: Comments concerning this entry form in general.

REFERENCES QUOTED

A3.115. *REF#1*

Internal name: Ref1 (Field)

Nature: Optional
Type: Number field
Values: any

Description: The reference number of the reference used in providing the taxonomic data. If the taxonomic data was the default the reference need not be stated since it will be assumed to be that used in the standard taxonomy.

HELP: E.g. if the reference used is Graham, 1987 (REF#1252) enter "1252" in this field.

A3.116. *Reference Abbrev.1*

Internal name: REF1 (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only (calculated field)

Description: The reference abbreviation for the Reference number specified in the **Ref1** field.

HELP: Don't worry about this field, the computer fills in this field automatically based upon the ***REF#*** entered.

A3.117. *Pages1*

Internal name: Pages1 (Field)

Nature: Optional
Type: Text field
Values: any

Description: The pages from which the data is derived.

Space for seven seperate references is provided. The format is the same in each case. Each is distinguished with a different number or letter. Thus, the second reference number field (labeled **REF#**) has the field name REF#B, the third REF#C, and so on.

At the bottom of the entry form are fields related to Editors. This is solely for record keeping and need not be used.

A3.118. *Editor1*

Internal name: Editor1 (Field)

Nature: Optional
Type: Text field
Values: any

Description: The name of the editor of this entry form. This is the person who makes changes to the record after the initial compiler has entered data.

A3.119. *Date 1*

Internal name: Date 1 (Field), IF editor 1 defined (Abacus)

Nature: Default
Type: Date field and abacus
Values: default only

Description: The date on which the edits were made. This date is automatically defined on entry of the editor's name in the preceding field.

Space for six seperate editors is provided. The format is the same in each case. Each is distinguished with a different number. Thus, the second editor name field has the field name Editor 2, the third Editor 3, and so on.

A4. ENTER CLIMATE STATIONS

Relation: ***CLIMATE STATIONS***

Unique record identifier: ***ENTRY#***

Menu Location: ***♦DATA ENTRY♦***

Accessibilty: ***PROGRAMMER and DATA ENTRY***

The **ENTER Climate Stations** form is the entry point for all data pertaining to climate stations. The climate information entered to date is taken from Müller's (1982) compilation of climate data, which he used for vegetation studies. These climate metrics have been used to calculate further parameters, such as mean winter temperature, summer temperature and the number of months with precipitation greater than some specified value. In this write up not all of these metrics, or calculable metrics, are included.

In addition to the monthly climate data the dataset now also includes the monthly Normalized Difference Vegetation Index (NDVI) for each climate station (taken from the gridded data arrays provided by the NOAA-EPA Global Ecosystems Database Project, 1992). This NDVI is derived from observations of the Advanced Very High Resolution Radiometer (AVHRR) housed on the NOAA-9 (1985-1988) and NOAA-11 (1989) satellites and gives a measure of the density of vegetation coverage based on the nature of light reflected back from the ground to the satellite. A systematic relationship between this index and Net Primary Productivity (NPP) has been shown in a number of studies (Goward and Dye, 1987; Goward et al., 1985).[26] Abacii within the database are used to calculate additional metrics, including Mean Annual Temperature (MAT), Mean Annual Range of Temperature (MART), maximum annual NDVI, and so forth. Further calculations are made as required.

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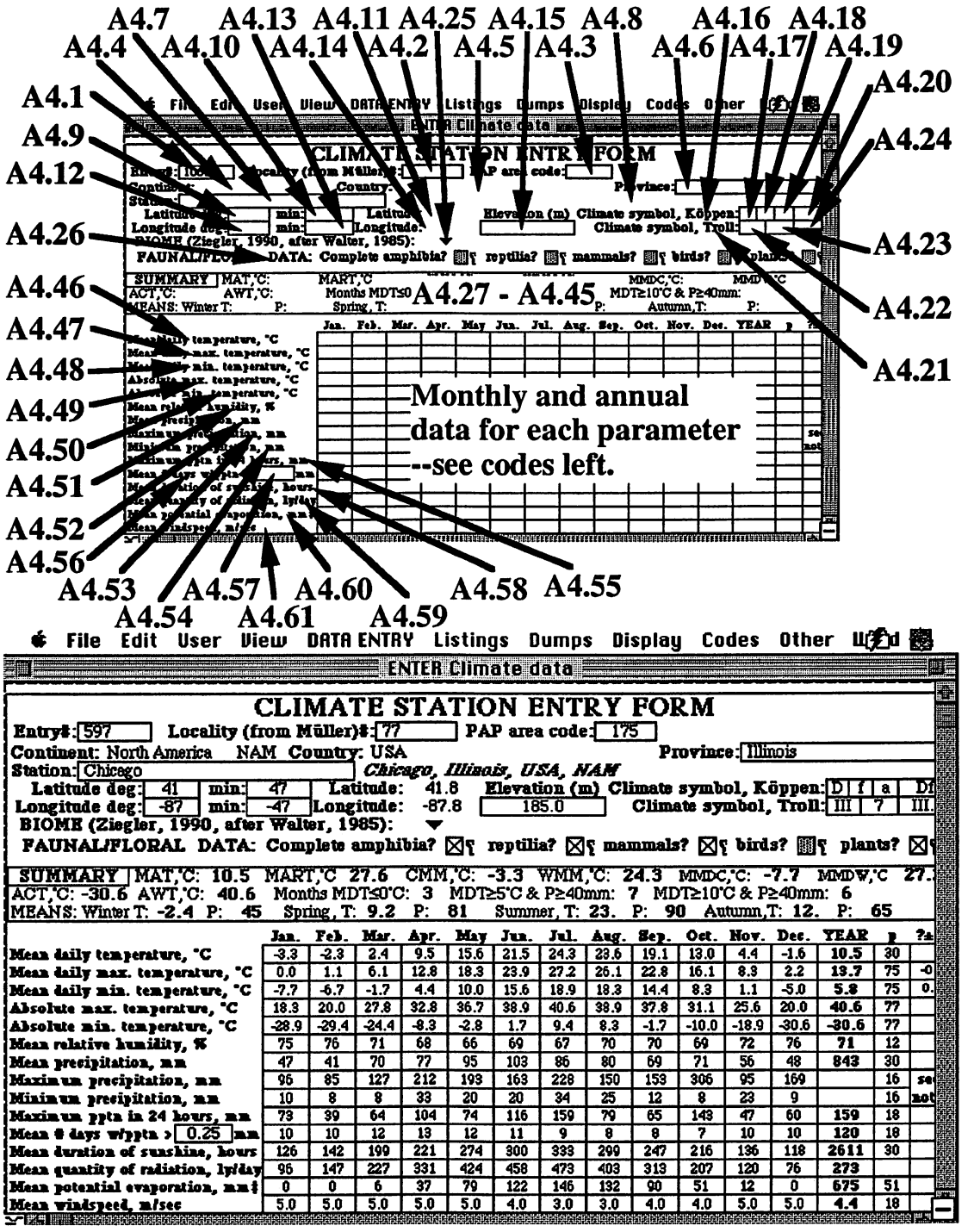
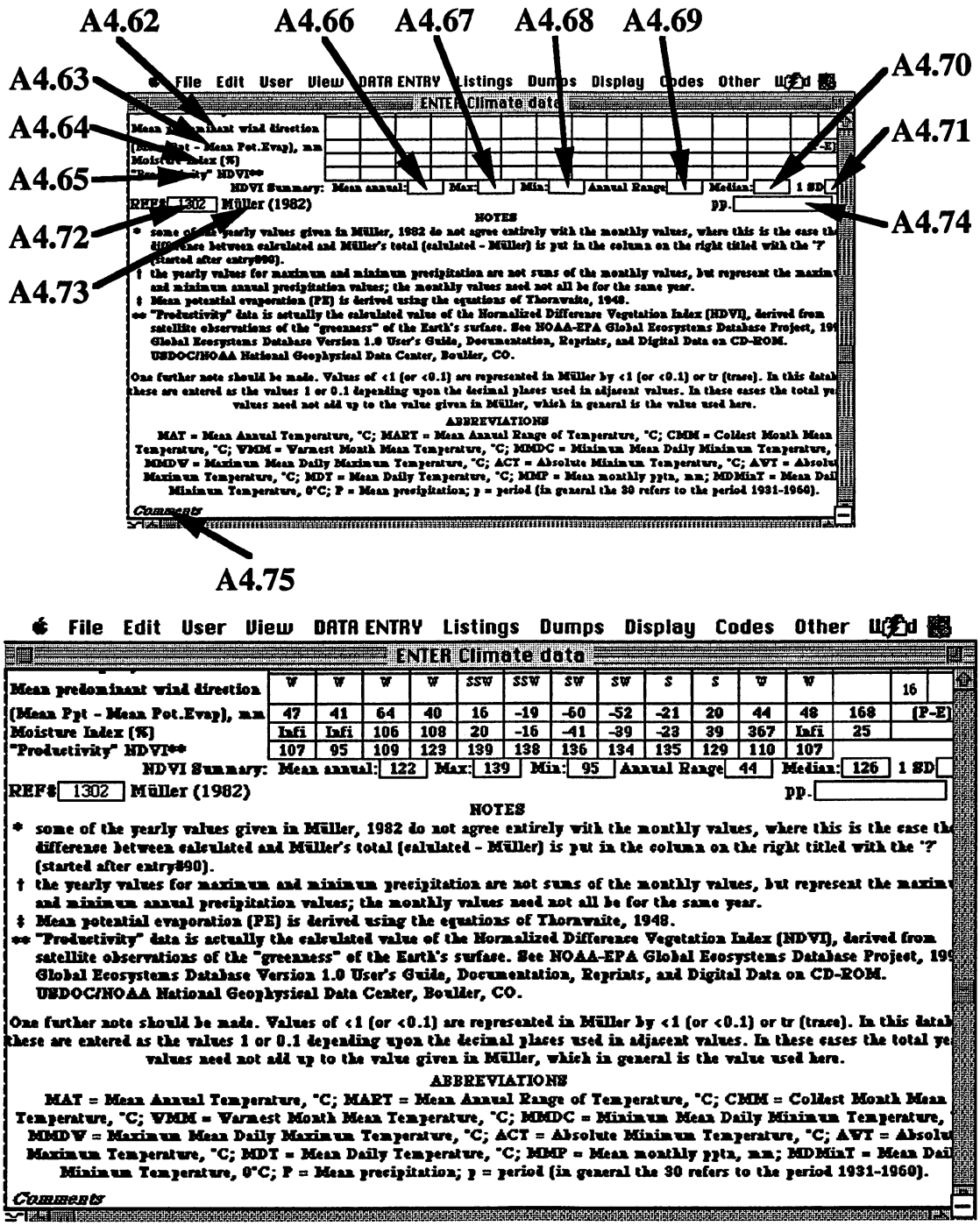
26. The data included in the climate station dataset are obtained by taking the monthly NDVI gridded datasets for the years 1986-1990, producing average monthly values for this period, and then extracting values that occur at the geographic sites of each climate station. Applications of the NDVI dataset have been discussed extensivley in the remote sensing literature, especially the use of the vegetation index to examine Net Primary Productivity (Cihlar et al., 1991; Goward and Dye, 1987; Goward et al., 1985; Hielkema et al., 1987; Running and Nemani, 1988; Sellars, 1987). Comparasons between satellite derived data and ground-based obsrvations of NPP have shown a systematic underestimate in predicted compared with actual values (Goward and Dye, 1987; Goward et al., 1985). Recently, Lottes and Ziegler (1994) have used the NDVI data to examine the relation between climate, productivity and peat formation. Regardless, the intergration of this dataset with the global diversity and climate dataset, described in this Chapter, provides the potential for examining many present issues in ecology, while also providing further power for examing the past. This will be examined after completion of this disseration.

The propensity for meterological stations to occur in lowland sites reflects Müller's original requirements: acceptable stations must contain data for a large array of climate parameters representing time series on the order of 30 years (typical of "climate"). Consequently most stations are located in large towns or cities that historically occupy lowland sites. Large urban areas tend to influence local climate. Peterson (1973) notes that mean annual temperatures (MAT) of cities are generally ≈0.6-0.8 °C higher than surrounding rural areas, with minimum winter temperatures being ≈1.1-1.7°C warmer. This disparity depends on the size of the urban area, for Chicago the difference in MAT is 0.6 °C, while for New York City it is 1.1 °C. With few exceptions most of the cities and towns used by Müller (1982) are smaller than these extremes and urban effects on climate are minor compared with the overall patterns being investigated. This bias towards low elevation locations closely mimics the biases in the geological record that tend to overrepresent low elevation environments. Since the modern dataset was originally designed for examining modern climate as a way of understanding the paleoclimate incicated by the rock record, this bias may have been fortuitous



	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	YEAR	p	?±
Mean daily temperature, °C	-3.3	-2.3	2.4	9.5	15.6	21.5	24.3	23.6	19.1	13.0	4.4	-1.6	10.5	30	
Mean daily max. temperature, °C	0.0	1.1	6.1	12.8	18.3	23.9	27.2	26.1	22.8	16.1	8.3	2.2	13.7	75	-0
Mean daily min. temperature, °C	-7.7	-6.7	-1.7	4.4	10.0	15.6	18.9	18.3	14.4	8.3	1.1	-5.0	5.8	75	0.
Absolute max. temperature, °C	18.3	20.0	27.8	32.8	36.7	38.9	40.6	38.9	37.8	31.1	25.6	20.0	40.6	77	
Absolute min. temperature, °C	-28.9	-29.4	-24.4	-8.3	-2.8	1.7	9.4	8.3	-1.7	-10.0	-18.9	-30.6	-30.6	77	
Mean relative humidity, %	75	76	71	68	66	69	67	70	70	69	72	76	71	12	
Mean precipitation, mm	47	41	70	77	95	103	86	80	69	71	56	48	843	30	
Maximum precipitation, mm	96	85	127	212	193	163	228	150	159	306	95	169		16	se
Minimum precipitation, mm	10	8	8	33	20	20	34	25	12	8	23	9		16	not
Maximum ppta in 24 hours, mm	73	39	64	104	74	116	159	79	65	143	47	60	159	18	
Mean # days w/ppta > 0.25 mm	10	10	12	13	12	11	9	8	8	7	10	10	120	18	
Mean duration of sunshine, hours	126	142	199	221	274	300	333	299	247	216	136	118	2611	30	
Mean quantity of radiation, ly/day	95	147	227	331	424	458	473	403	313	207	120	76	273		
Mean potential evaporation, mm‡	0	0	6	37	79	122	146	132	90	51	12	0	675	51	
Mean windspeed, m/sec	5.0	5.0	5.0	5.0	5.0	4.0	3.0	3.0	4.0	4.0	5.0	5.0	4.4	18	

FIGURE A4.08. Screen picture of the principal entry form in the "Climate Station" relation.



File Edit User View DATA ENTRY Listings Dumps Display Codes Other
ENTER Climate data

Mean predominant wind direction	W	W	W	W	SSW	SSW	SW	SW	S	S	W	W		16	
(Mean Ppt - Mean Pot.Evap), mm	47	41	64	40	16	-19	-60	-52	-21	20	44	48	168		(P-E)
Moisture Index (%)	Infi	Infi	106	108	20	-16	-41	-39	-23	39	367	Infi	25		
"Productivity" NDVI**	107	95	109	123	139	138	136	134	135	129	110	107			

NDVI Summary: Mean annual: 122 Max: 139 Min: 95 Annual Range 44 Median: 126 1 SD
REFS 1302 Müller (1982)
pp.
NOTES
* some of the yearly values given in Müller, 1982 do not agree entirely with the monthly values, where this is the case th
difference between calculated and Müller's total (calulated - Müller) is put in the column on the right titled with the '?'
(started after entry#90).
† the yearly values for maximum and minimum precipitation are not sums of the monthly values, but represent the maxim
and minimum annual precipitation values; the monthly values need not all be for the same year.
‡ Mean potential evaporation (PE) is derived using the equations of Thornwaite, 1948.
** "Productivity" data is actually the calculated value of the Normalized Difference Vegetation Index (NDVI), derived from
satellite observations of the "greenness" of the Earth's surface. See NOAA-EPA Global Ecosystems Database Project, 19
Global Ecosystems Database Version 1.0 User's Guide, Documentation, Reprints, and Digital Data on CD-ROM.
USDOC/NOAA National Geophysical Data Center, Boulder, CO.
One further note should be made. Values of <1 (or <0.1) are represented in Müller by <1 (or <0.1) or tr (trace). In this datab
these are entered as the values 1 or 0.1 depending upon the decimal places used in adjacent values. In these cases the total ye
values need not add up to the value given in Müller, which in general is the value used here.
ABBREVIATIONS
MAT = Mean Annual Temperature, °C; MART = Mean Annual Range of Temperature, °C; CMM = Coldest Month Mean
Temperature, °C; WMM = Warmest Month Mean Temperature, °C; MMDC = Minimum Mean Daily Minimum Temperature,
MMDW = Maximum Mean Daily Maximum Temperature, °C; ACT = Absolute Minimum Temperature, °C; AWT = Absolu
Maximum Temperature, °C; MDT = Mean Daily Temperature, °C; MMP = Mean monthly ppts, mm; MDMinT = Mean Dail
Minimum Temperature, 0°C; P = Mean precipitation; p = period (in general the 30 refers to the period 1931-1960).
Comments

Figure A4.08., continued.

A4.1. *Entry#*

Internal name: Entry# (Field), #ing (Abacus)

Nature: MANDATORY (Defaulted field)[27]
Type: Number field and abacus
Values: any unique integer (the database default is strongly recommended).

Description: This is an arbitrary, but unique, number that the computer uses to facilitate searches and links for locality records. On the other entry forms this is the number required in fields prefixed by the word '**Entry#**'. The computer provides a new number for each new climate station record added.

HELP: Let the computer deal with this field. Selectability is maintained only to facilitate sorts and queries.

A4.2. *Locality# (from Müller)*

Internal name: Locality# from Müller (Field)

Nature: Optional
Type: Number field
Values: the appropriate number from Müller's compilation

Description: The number assigned to each climate station in Müller's (1982) compilation.

A4.3. *PAP area code*

Internal name: PAP area code (Field)

Nature: Optional (recommended)
Type: Text field.
Values: any appropriate code (see section D1 or D2)

Description: The code used by the Paleogeographic Atlas Project, University of Chicago, to represent geographic regions in their databases.

A4.4. *Continent*

Internal name: Continent (Field), Lookup continent for area code (Abacus)

---

27. This is a validated field. This field must be defined. The computer will make an audible error if this is not defined

Nature: Optional (Defaulted field)
Type: Text field and abacus
Values: any (a continent name would be appropriate):
Africa
Antarctica
Asia
Australiasia
Europe
"India" (usually included as part of asia)
North America
South America

Description: The name of the continent on which the climate station is situated. On entry the abbreviated continent name is automatically placed to the right of this field.

A4.5. *Country*

Internal name: Country (Field), Lookup country for area code (Abacus)

Nature: Optional (Defaulted field)
Type: Text field and abacus
Values: any.

Description: The name of the country on which the climate station is situated.

A4.6. *State/Province*

Internal name: Province/State (Field), Lookup province/state for area code (Abacus)

Nature: Optional (Defaulted field
Type: Text field and abacus
Values: any.

Description: The name of the province or state where the station is situated.

A4.7. *Station name*

Internal name: Station (Field)

Nature: MANDATORY (Defaulted field)[28]

28. This is a validated field. This field must be defined. The computer will make an audible error if this is not defined

Type: Text field
Values: any

Description: The name of the station. For data from Müller's (1982) compilation this name is usually the name of the town or city in which the station is found.

A4.8. *Station/Province/Country/Continent*

Internal name: Station/Country_name (Field),
Station/Province/Country/Continent (Abacus)

Nature: Default
Type: Text field and abacus
Values: default only.

Description: This gives the geographic location of the station based on the entries in the preceding entry fields.

A4.9. *Latitude, degrees*

Internal name: Latitude_deg. (Field)

Nature: Optional (Strongly recommended)
Type: Number field
Values: any integer between -90 and +90

Description: This is the number of degrees of latitude at which the station occurs: north, positive; south, negative.

A4.10. *Latitude, minutes*

Internal name: Latitude_min (Field)

Nature: Optional (Strongly recommended)
Type: Number field
Values: any integer between -60 and 60.

Description: This is the number of minutes of latiude, in addition to the number of degrees, that the station is situated at: north, positive; south, negative.

A4.11. *Latitude*

Internal name: Latitude_decimal (Field), Latitude_decimal (Abacus)

Nature: Optional (Strongly recommended)
Type: Number field and abacus
Values: any number between -90 and 90, with 1 decimal place.

Description: This is the decimal value for the latitude at which the station is situated at: north, positive; south, negative.

HELP: If the latitude has already been entered in degrees and minutes then let the computer define this field.

A4.12. *Longitude, degrees*

Internal name: Longitude_deg. (Field)

Nature: Optional (Strongly recommended)
Type: Number field
Values: any integer between -180 and +180

Description: This is the number of degrees of longitude at which the station occurs: east, positive; west, negative.

A4.13. *Longitude, minutes*

Internal name: Longitude_min (Field)

Nature: Optional (Strongly recommended)
Type: Number field
Values: any integer between -60 and 60.

Description: This is the number of minutes of longitude, in addition to the number of degrees, that the station is situated at: east, positive; west, negative.

A4.14. *Longitude*

Internal name: Longitude_decimal (Field), Longitude_decimal (Abacus)

Nature: Optional (Strongly recommended)
Type: Number field and abacus
Values: any number between -180 and +180, with 1 decimal place.

Description: This is the decimal value for the longitude at which the station is situated at: east, positive; west, negative.

HELP: If the latitude has already been entered in degrees and minutes then let the computer define this field.

A4.15. *Elevation*

Internal name: Elevation (Field)

Nature: Optional (recommended)
Type: Number field
Values: any integer

Description: This is the present day elevation of the climate station, in metres.

HELP: Elevation has an important infuence on local climate and as such it is strongly recommended that this field be defined.

A4.16. *Climate symbol, Köppen* Button

Internal name: n/a

Nature:n/a
Type: Sequence button
Values: n/a

Description: This accesses an explanatory table of the Köppern climate classification scheme

A4.17. *Köppen 1st letter*

Internal name: Köppen 1st letter (Field)

Nature: Optional (recommended)
Type: Text field
Values: access the ***Climate symbol, Köppen*** **button** for possible entries.

Description: This is the first letter in the Köppen climate classification scheme.

HELP: Access the explanatory table by using the ***Climate symbol, Köppen*** **button.**

A4.18. *Köppen 2nd letter*

Internal name: Köppen 2nd letter (Field)

Nature: Optional (recommended)

Type: Text field
Values: access the ***Climate symbol, Köppen*** **button** for possible entries.

Description: This is the second letter in the Köppen climate classification scheme.

HELP: Access the explanatory table by using the ***Climate symbol, Köppen*** **button.**

A4.19. *Köppen 3rd letter*

Internal name: Köppen 3rd letter (Field)

Nature: Optional (recommended)
Type: Text field
Values: access the ***Climate symbol, Köppen*** **button** for possible entries.

Description: This is the third letter in the Köppen climate classification scheme.

HELP: Access the explanatory table by using the ***Climate symbol, Köppen*** **button.**

A4.20. *Köppen classification*

Internal name: Köppen climate symbol (Field), Köppen symbol (abacus)

Nature: Optional (default)
Type: Text field and abacus
Values: default value

Description: This is the Köppen climate classification symbol for this climate symbol derived from the previous three fields..

HELP: The computer will generate this based on the enries in the previous three fields. Access the explanatory table by using the ***Climate symbol, Köppen*** **button.**

A4.21. *Climate symbol, Troll* Button

Internal name: n/a

Nature:n/a
Type: Sequence button
Values: n/a

Description: This accesses an explanatory table of the Troll climate classification scheme

A4.22. *Troll 1st letter*

Internal name: Troll 1st letter (Field)

Nature: Optional (recommended)
Type: Text field
Values: access the ***Climate symbol, Troll*** **button** for possible entries.

Description: This is the first letter in the Troll climate classification scheme.

HELP: Access the explanatory table by using the ***Climate symbol, Troll*****button.**

A4.23. *Troll 2nd letter*

Internal name: Troll 2nd letter (Field)

Nature: Optional (recommended)
Type: Text field
Values: access the ***Climate symbol, Troll*****button** for possible entries.

Description: This is the second letter in the Troll climate classification scheme.

HELP: Access the explanatory table by using the ***Climate symbol, Troll*****button.**

A4.24. *Troll classification*

Internal name: Troll climate symbol (Field), Troll_symbol (abacus)

Nature: Optional (default)
Type: Text field and abacus
Values: default value

Description: This is the Troll climate classification symbol for this climate symbol derived from the previous two fields..

HELP: The computer will generate this based on the enries in the previous two fields. Access the explanatory table by using the ***Climate symbol, Troll*****button.**

A4.25. *Biome*

Internal name: Biome (Field)

Nature: Optional
Type: Text field (static popup)
Values: popup menu values only: 1 through 10.

Description: This is the biome classification scheme of Walter (1985), as modified by Ziegler (1990). On entry of the appropriate biome number code the database will automatically provide the full text description of what that biome represents. These are as follows:

1	Everwet (evergreen tropical rain forest)
2	Summerwet (tropical deciduous forests or savannas)
3	Subtropical desert (subtropical desert vegetation)
4	Winterwet (sclerophyllous woody plants)
5	Warm temperate (temperate evergreen forests)
6	Cool temperate (nemoral broadleaf deciduous forests)
7	Midlatitude desert (steppe to desert with cold winters)
8	Cold temperate (boreal coniferous forests, taiga)
9	Arctic (tundra vegetation, treeless)
10	Glacial (no vegetation)

A4.26. *Faunal/Floral data complete?*

These five fields are for record keeping within the database. They record which data have been entered for each climate station, for instance whether mammal data have been entered or amphibians.

Internal name: Fauna Amphibian data complete? (Field), Fauna reptile data complete? (Field), Fauna mammal data complete? (Field), Fauna bird data complete? (Field), Fauna plant data complete? (Field)

Nature: Optional (recommended)
Type: Flag fild (check box)
Values: Yes, checked; No, unchecked

Description: Keeps track of which data have been recorded for the climate station

The next 18 fields (A4.27-A4.45) give values for a series of calculated climate metrics using the data taken from Müller (1982). These are only some of the calculable metrics possible. Fields are described in the order in which the computer sees them on the entry form (using the <TAB> button; essentially reading left to right and top to bottom).

A4.27. *MAT, °C*

Internal name: MAT (Field), Mean anual daily temp (abacus)

Nature: Default

Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the MAT (Mean Annual Temperature) for the climate station derived by taking the mean of the monthly mean daily temperatures (A4.46)

A4.28. *MART, °C*

Internal name: MART (Field), MART (abacus)

Nature: Default
Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the MART (Mean Annual Range of Temperature) for the climate station derived by taking the absolute difference between the coldest month mean temperature (CMM) and the warmest month mean temperature (WMM). This gives an indication of thermal seasonality for the localition.

A4.29. *CMM, °C*

Internal name: CMM (Field), CMM (abacus)

Nature: Default
Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the CMM (Coldest Month Mean Daily Temperature) for the climate station. The database scans the monthly values for Mean daily temperatures (A4.46) and takes the minimum value

A4.30. *WMM, °C*

Internal name: WMM (Field), WMM (abacus)

Nature: Default
Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the WMM (Warmest Month Mean Daily Temperature) for the climate station. The database scans the monthly values for Mean daily temperatures (A4.46) and takes the maximum value

A4.31. *MMDC, °C*

Internal name: MMDC (Field), MMDC (abacus)

Nature: Default
Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the MMDC (Minimum Mean Daily Minimum Temperature) for the climate station. The database scans the monthly values for Mean daily minimum temperatures (A4.48) and takes the minimum value

A4.32. *MMDW, °C*

Internal name: MMDW (Field), MMDW (abacus)

Nature: Default
Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the MMDW (Maximum Mean Daily Maximum Temperature) for the climate station. The database scans the monthly values for Mean daily maximum temperatures (A4.47) and takes the maximum value

A4.33. *ACT, °C*

Internal name: ACT (Field), Ann_abs_min_temp (abacus)

Nature: Default
Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the ACT (Absolute Minimum Temperature) for the climate station. The database scans the monthly values for Absolute Mininimum Temperatures (A4.50) and takes the minimum value

A4.34. *AWT, °C*

Internal name: AWT (Field), Ann_abs_max_temp (abacus)

Nature: Default
Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the AWT (Absolute Warmest Temperature) for the climate station. The database scans the monthly values for Absolute Maximum Temperatures (A4.49) and takes the maximum value

A4.35. *Months MDT≤0°C*

Internal name: Mo w means ≤0°C (Field), Mo≤0°C (abacus)

Nature: Default
Type: Number field and abacus
Values: default value

Description: This is the number of months with mean daily temperatures (A4.46) below, or equal to, 0°C.

A4.36. *Months MDT≤5°C & P≥40mm*

Internal name: mo meanT≥5°C &ppt≥40mm (Field), Mo≥5°C ≥40mm (abacus)

Nature: Default
Type: Number field and abacus
Values: default value

Description: This is the number of months with mean daily temperatures (A4.46) greater than, or equal to, 5°C, and which have mean monthly precipitation of at least 40mm.

HELP: Combinations of precipitation and thermal metrics have been found to be useful in examing the distribution of vegetation and biomes. Much better than using only temperature or precipitation.

A4.37. *Months MDT≥10°C & P≥40mm*

Internal name: mo meanT≥10°C&ppt≥40mm (Field), Mo ≥10°C ≥40mm(abacus)

Nature: Default
Type: Number field and abacus
Values: default value

Description: This is the the number of months with mean daily temperatures (A4.46) greater than, or equal to, 10°C, and which have mean monthly precipitation of at least 40mm.

A4.38. *Mean winter T*

Internal name: Season T Winter (Field), Season T Wnter (abacus)

Nature: Default
Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the mean winter temperature. It is derived by taking the mean of the mean daily temperatures (A4.46) of the three winter months (December, January and Februray in the northern hemisphere, and June, July and August in the southern hemisphere).

A4.39. *Mean winter P*

Internal name: Season_P_Winter (Field), Season_P_Wnter (abacus)

Nature: Default
Type: Number field and abacus
Values: default value

Description: This is the mean winter precipitation. It is derived by taking the mean of the mean precipitation (A4.52) of the three winter months (December, January and Februray in the northern hemisphere, and June, July and August in the southern hemisphere).

A4.40. *Mean Spring T*

Internal name: Season_T_Spring (Field), Season_T_Spring (abacus)

Nature: Default
Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the mean spring temperature. It is derived by taking the mean of the mean daily temperatures (A4.46) of the three spring months (March, April and May in the northern hemisphere, and September, October and November in the southern hemisphere).

A4.41. *Mean spring P*

Internal name: Season_P_Spring (Field), Season_P_Spring (abacus)

Nature: Default
Type: Number field and abacus
Values: default value

Description: This is the mean spring precipitation. It is derived by taking the mean of the mean precipitation (A4.52) of the three winter months (March, April and May in the northern hemisphere, and September, October and November in the southern hemisphere).

A4.42. *Mean summer T*

Internal name: Season_T_Summer (Field), Season_T_Summer (abacus)

Nature: Default
Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the mean summer temperature. It is derived by taking the mean of the mean daily temperatures (A4.46) of the three summerr months (June, July and August in the northern hemisphere, and December, January and February in the southern hemisphere).

A4.43. *Mean summer P*

Internal name: Season_P_Summer (Field), Season_P_Summer (abacus)

Nature: Default
Type: Number field and abacus
Values: default value

Description: This is the mean summer precipitation. It is derived by taking the mean of the mean precipitation (A4.52) of the three summer months (June, July and August in the northern hemisphere, and December, January and February in the southern hemisphere).

A4.44. *Mean autumn T*

Internal name: Season_T_Autumn (Field), Season_T_Autumn (abacus)

Nature: Default
Type: Number field and abacus
Values: default value (1 decimal place)

Description: This is the mean autumn temperature. It is derived by taking the mean of the mean daily temperatures (A4.46) of the three autumn months (September, October and November in the northern hemisphere, and March, April and May in the southern hemisphere).

A4.45. *Mean autumn P*

Internal name: Season_P_Autumn (Field), Season_P_Autumn (abacus)

Nature: Default
Type: Number field and abacus
Values: default value

Description: This is the mean autumn precipitation. It is derived by taking the mean of the mean precipitation (A4.52) of the three autumn months (September, October and November in the northern hemisphere, and March, April and May in the southern hemisphere).

In the following fields, the data from Müller (1982; or other climate data source if additional stations are to be added) are entered. For each parameter a monthly value is given, together with an annual mean, or sum where appropriate, and the number of years of data (**p**). Each parameter is dealt with separately in the following descriptions; the field and abacus names for each month, the annual value and number of years of observations are listed for each.

A4.46. *Mean daily temperature, °C*

Internal name: 1-A Mean daily T°C Jan (Field); 2-A Mean daily T°C Feb (Field); 3-A Mean daily T°C Mar (Field); 4-A Mean daily T°C Apr (Field); 5-A Mean daily T°C May (Field); 6-A Mean daily T°C Jun (Field); 7-A Mean daily T°C Jul (Field); 8-A Mean daily T°C Aug (Field); 9-A Mean daily T°C Sep (Field); 10-A Mean daily T°C Oct (Field); 11-A Mean daily T°C Nov (Field); 12-A Mean daily T°C Dec (Field); Y-A Mean daily T°C Year (Field), Mean annual daily temp (Abacus); P-A Mean daily T°C P (Field).

Nature: Optional
Type: Number field
Values: any number (1 decimal place)

Description: The mean daily temperature for each month.

A4.47. *Mean daily maximum temperature, °C*

Internal name: 1-B Mean daily Max T°C Jan (Field); 2-B Mean daily Max T°C Feb (Field); 3-B Mean daily Max T°C Mar (Field); 4-B Mean daily Max T°C Apr (Field); 5-B Mean daily Max T°C May (Field); 6-B Mean daily Max T°C Jun (Field); 7-B Mean daily Max T°C Jul (Field); 8-B Mean daily Max T°C Aug (Field); 9-B Mean daily Max T°C Sep (Field); 10-B Mean daily Max T°C Oct (Field); 11-B Mean daily Max T°C Nov (Field); 12-B Mean daily Max T°C Dec (Field); Y-B Mean daily Max T°C Year (Field), Mean daily max temp (Abacus); P-B Mean daily Max T°C P (Field).

Nature: Optional
Type: Number field
Values: any number (1 decimal place)

Description: The mean daily maximum temperature for each month. In each case the maximum temperature for each day is taken and the average taken for all days in that month.

A4.48. *Mean daily minimum temperature, °C*

Internal name: 1-C Mean daily Min T°C Jan (Field); 2-C Mean daily Min T°C Feb (Field); 3-C Mean daily Min T°C Mar (Field); 4-C Mean daily Min T°C Apr (Field); 5-C Mean daily Min T°C May (Field); 6-C Mean daily Min T°C Jun (Field); 7-C Mean daily Min T°C Jul (Field); 8-C Mean daily Min T°C Aug (Field); 9-C Mean daily Min T°C Sep (Field); 10-C Mean daily Min T°C Oct (Field); 11-C Mean daily Min T°C Nov (Field); 12-C Mean daily Min T°C Dec (Field); Y-C Mean daily Min T°C Year (Field), Mean daily min temp (Abacus); P-C Mean daily Min T°C P (Field).

Nature: Optional
Type: Number field
Values: any number (1 decimal place)

Description: The mean daily minimum temperature for each month. In each case the minimum temperature for each day is taken and the average taken for all days in that month. This is then averaged over the number of years for which there are records.

A4.49. *Absolute maximum temperature, °C*

Internal name: 1-D Mean daily Abs Max T°C Jan (Field); 2-D Mean daily Abs Max T°C Feb (Field); 3-D Mean daily Abs Max T°C Mar (Field); 4-D Mean daily Abs Max T°C Apr (Field); 5-D Mean daily Abs Max T°C May (Field); 6-D Mean daily Abs Max T°C Jun (Field); 7-D Mean daily Abs Max T°C Jul (Field); 8-D Mean daily Abs Max T°C Aug (Field); 9-D Mean daily Abs Max T°C Sep (Field); 10-D Mean daily Abs Max T°C Oct (Field); 11-D Mean daily Abs Max T°C Nov (Field); 12-D Mean daily Abs Max T°C Dec (Field); Y-D Abs Max T°C Year (Field), Ann abs max temp (Abacus); P-D Mean daily Abs Max T°C P (Field).

Nature: Optional
Type: Number field
Values: any number (1 decimal place)

Description: The absolute maximum daily temperature for the month.

A4.50. *Absolute minimum temperature, °C*

Internal name: 1-E Mean daily Abs Min T°C Jan (Field); 2-E Mean daily Abs Min T°C Feb (Field); 3-E Mean daily Abs Min T°C Mar (Field); 4-E Mean daily Abs Min T°C Apr (Field); 5-E Mean daily Abs Min T°C May (Field); 6-E Mean daily Abs Min T°C Jun (Field); 7-E Mean daily Abs Min T°C Jul (Field); 8-E Mean daily Abs Min T°C Aug (Field); 9-E Mean daily Abs Min T°C Sep (Field); 10-E Mean daily Abs Min T°C Oct (Field); 11-E Mean daily Abs Min T°C Nov (Field); 12-E Mean daily Abs Min T°C Dec

(Field); Y-E Abs Min T°C Year (Field), Ann abs min temp (Abacus); P-E Mean daily Abs Min T°C P (Field).

Nature: Optional
Type: Number field
Values: any number (1 decimal place)

Description: The absolute minimum daily temperature for the month.

A4.51. *Mean relative humidity, %*

Internal name: 1-F Mean rel hum% Jan (Field); 2-F Mean rel hum% Feb (Field); 3-F Mean rel hum% Mar (Field); 4-F Mean rel hum% Apr (Field); 5-F Mean rel hum% May (Field); 6-F Mean rel hum% Jun (Field); 7-F Mean rel hum% Jul (Field); 8-F Mean rel hum% Aug (Field); 9-F Mean rel hum% Sep (Field); 10-F Mean rel hum% Oct (Field); 11-F Mean rel hum% Nov (Field); 12-F Mean rel hum% Dec (Field); Y-F Mean rel hum% Year (Field), mean annual relative humidity (Abacus); P-F Mean rel humidity% P (Field).

Nature: Optional
Type: Number field
Values: any number

Description: The mean relative humidity (%) for the month.

A4.52. *Mean precipitation, mm*

Internal name: 1-G Mean precipitation Jan (Field); 2-G Mean precipitation Feb (Field); 3-G Mean precipitation Mar (Field); 4-G Mean precipitation Apr (Field); 5-G Mean precipitation May (Field); 6-G Mean precipitation Jun (Field); 7-G Mean precipitation Jul (Field); 8-G Mean precipitation Aug (Field); 9-G Mean precipitation Sep (Field); 10-G Mean precipitation Oct (Field); 11-G Mean precipitation Nov (Field); 12-G Mean precipitation Dec (Field); Y-G Mean precipitation Year (Field); P-G Mean precipitation P (Field).

Nature: Optional
Type: Number field
Values: any number

Description: The mean monthly precipitation in millimetres. Mean is the average over the years recorded.

A4.53. *Maximum precipitation, mm*

Internal name: 1-H Max ppt Jan (Field); 2-H Max ppt Feb (Field); 3-H Max ppt Mar (Field); 4-H Max ppt Apr (Field); 5-H Max ppt May (Field); 6-H Max ppt Jun (Field); 7-H Max ppt Jul (Field); 8-H Max ppt Aug (Field); 9-H Max ppt Sep (Field); 10-H Max ppt Oct (Field); 11-H Max ppt Nov (Field); 12-H Max ppt Dec (Field); Y-H Max ppt Year (Field); P-H Max ppt P (Field).

Nature: Optional
Type: Number field
Values: any number

Description: The mean maximum monthly precipitation over the record years of observations.

A4.54. *Minimum precipitation, mm*

Internal name: 1-I Min ppt Jan (Field); 2-I Min ppt Feb (Field); 3-I Min ppt Mar (Field); 4-I Min ppt Apr (Field); 5-I Min ppt May (Field); 6-I Min ppt Jun (Field); 7-I Min ppt Jul (Field); 8-I Min ppt Aug (Field); 9-I Min ppt Sep (Field); 10-I Min ppt Oct (Field); 11-I Min ppt Nov (Field); 12-I Min ppt Dec (Field); Y-I Min ppt Year (Field); P-I Min ppt P (Field).

Nature: Optional
Type: Number field
Values: any number

Description: The mean minimum monthly precipitation over the record years of observations.

A4.55. *Maximum precipitation in 24 hours, mm*

Internal name: 1-J Max ppt in 24h Jan (Field); 2-J Max ppt in 24h Feb (Field); 3-J Max ppt in 24h Mar (Field); 4-J Max ppt in 24h Apr (Field); 5-J Max ppt in 24h May (Field); 6-J Max ppt in 24h Jun (Field); 7-J Max ppt in 24h Jul (Field); 8-J Max ppt in 24h Aug (Field); 9-J Max ppt in 24h Sep (Field); 10-J Max ppt in 24h Oct (Field); 11-J Max ppt in 24h Nov (Field); 12-J Max ppt in 24h Dec (Field); Y-J Max ppt in 24h Year (Field); P-J Max ppt in 24h P (Field).

Nature: Optional
Type: Number field
Values: any number

Description: The maximum precipitation in 24 hours for each month, averaged over all of the years of observations.

A4.56. *Mean number of days with precipitation >x mm*

Internal name: 1-K Mean # days w ppt Jan (Field); 2-K Mean # days w ppt Feb (Field); 3-K Mean # days w ppt Mar (Field); 4-K Mean # days w ppt Apr (Field); 5-K Mean # days w ppt May (Field); 6-K Mean # days w ppt Jun (Field); 7-K Mean # days w ppt Jul (Field); 8-K Mean # days w ppt Aug (Field); 9-K Mean # days w ppt Sep (Field); 10-K Mean # days w ppt Oct (Field); 11-K Mean # days w ppt Nov (Field); 12-K Mean # days w ppt Dec (Field); Y-K Mean # days w ppt Year (Field), mean number of days with pptn (Abacus); P-K Mean # days w ppt P (Field).

Nature: Optional
Type: Number field
Values: any number

Description: The mean number of days with precipitation greater than a specified value. Averaged over the years of observations. The specfied value is different for different parts of the world (unfortunately) and is entered in A4.57.

A4.57. *days greater than?*

Internal name: days greater than? (Field);

Nature: Optional
Type: Number field
Values: any number

Description: The specified precipitation value for the previous fields (A4.56).

A4.58. *Mean duration of sunshine, hours*

Internal name: 1-L Mean duration of sunshine Jan (Field); 2-L Mean duration of sunshine Feb (Field); 3-L Mean duration of sunshine Mar (Field); 4-L Mean duration of sunshine Apr (Field); 5-L Mean duration of sunshine May (Field); 6-L Mean duration of sunshine Jun (Field); 7-L Mean duration of sunshine Jul (Field); 8-L Mean duration of sunshine Aug (Field); 9-L Mean duration of sunshine Sep (Field); 10-L Mean duration of sunshine Oct (Field); 11-L Mean duration of sunshine Nov (Field); 12-L Mean duration of sunshine Dec (Field); Y-L Mean duration of sunshine Year (Field), Mean ann dur sunshine (Abacus); P-L Mean duration of sunshine P (Field).

Nature: Optional
Type: Number field
Values: any number

Description: The mean monthly duration of sunshine for the number of years of observations (in hours).

A4.59. *Mean quantity of radiation, ly/hours*

Internal name: 1-M Mean quantity of radiation Jan (Field); 2-M Mean quantity of radiation Feb (Field); 3-M Mean quantity of radiation Mar(Field); 4-M Mean quantity of radiation Apr (Field); 5-M Mean quantity of radiation May (Field); 6-M Mean quantity of radiation Jun (Field); 7-M Mean quantity of radiation Jul (Field); 8-M Mean quantity of radiation Aug (Field); 9-M Mean quantity of radiation Sep (Field); 10-M Mean quantity of radiation Oct (Field); 11-M Mean quantity of radiation Nov (Field); 12-M Mean quantity of radiation Dec (Field); Y-M Mean quantity of radiation Year (Field), Mean ann radiation (Abacus); P-M Mean radiation P (Field).

Nature: Optional
Type: Number field
Values: any number

Description: The mean monthly radiation received at the station, in ly/day (1 ly/day = 0.485 W/m^2, since W/m^2 are the more accepted units today, the next update of the database will have radiation recalculated to these units.

A4.60. *Mean potential evaporation, mm*

Internal name: 1-N Mean pot evap Jan (Field); 2-N Mean pot evap Feb (Field); 3-N Mean pot evap Mar(Field); 4-N Mean pot evap Apr (Field); 5-N Mean pot evap May (Field); 6-N Mean pot evap Jun (Field); 7-N Mean pot evap Jul (Field); 8-N Mean pot evap Aug (Field); 9-N Mean pot evap Sep (Field); 10-N Mean pot evap Oct (Field); 11-N Mean pot evap Nov (Field); 12-N Mean pot evap Dec (Field); Y-N Mean pot evap Year (Field), Mean ann pot evap (Abacus); P-N Mean pot evap P (Field).

Nature: Optional
Type: Number field
Values: any number

Description: The mean monthly potential evaporation (PE) is based on a calculation not observations. This calculation is from Thornwaite (1948):

$$PE = 1.6 * L * ((10 * t^a) / I)$$

where PE = potential evapotranspiration, L = correction factor for different latitudes and month lengths, t = mean temperature of selected period of time, I = an index calculated from the 12 monthly mean temperatures, and a =a complicated geometric function of I.

A4.61. *Mean windspeed, m/sec*

Internal name: 1-O Mean windspeed Jan (Field); 2-O Mean windspeed Feb (Field); 3-O Mean windspeed Mar (Field); 4-O Mean windspeed Apr (Field); 5-O Mean windspeed May (Field); 6-O Mean windspeed Jun (Field); 7-O Mean windspeed Jul (Field); 8-O Mean windspeed Aug (Field); 9-O Mean windspeed Sep (Field); 10-O Mean windspeed Oct (Field); 11-O Mean windspeed Nov (Field); 12-O Mean windspeed Dec (Field); Y-O Mean windspeed Year (Field), Mean annual windspeed (Abacus); P-O Mean windspeed P(Field).

Nature: Optional
Type: Number field
Values: any number (1 decimal place)

Description: The mean monthly windspeed in metres per second.

A4.62. *Mean predominant wind direction*

Internal name: 1-P Mean predominant wind direction Jan (Field); 2-P Mean predominant wind direction Feb (Field); 3-P Mean predominant wind direction Mar (Field); 4-P Mean predominant wind direction Apr (Field); 5-P Mean predominant wind direction May (Field); 6-P Mean predominant wind direction Jun (Field); 7-P Mean predominant wind direction Jul (Field); 8-P Mean predominant wind direction Aug (Field); 9-P Mean predominant wind direction Sep (Field); 10-P Mean predominant wind direction Oct (Field); 11-P Mean predominant wind direction Nov (Field); 12-P Mean predominant wind direction Dec (Field); Y-P Mean predominant wind direction Year (Field); P-P Mean predominent wind direction (Field).

Nature: Optional
Type: Text field
Values: any

Description: The mean predominant wind direction for each month.

A4.63. *(Mean Ppt - Mean Pot.Evap) mm*

Internal name: 1-Ppt-Evap (Field); 2-Ppt-Evap (Field); 3-Ppt-Evap (Field); 4-Ppt-Evap (Field); 5-Ppt-Evap (Field); 6-Ppt-Evap (Field); 7-Ppt-Evap (Field); 8-Ppt-Evap (Field); 9-Ppt-Evap (Field); 10-Ppt-Evap (Field); 11-Ppt-Evap (Field); 12-Ppt-Evap(Field); Y-Ppt-Evap (Field).

Nature: Default
Type: Number field

Values: default values

Description: The mean difference between monthly precipitation and PE in millimetres. This was claculated by the databse using the information entered above.

A4.64. *Moisture Index (%)*

Internal name: MI_Jan (Field), Jan_Moisture_index (Abacus); MI_Feb (Field), Feb_Moisture_index (Abacus); MI_Mar (Field), Mar_Moisture_index (Abacus); MI_Apr (Field), Apr_Moisture_index (Abacus); MI_May (Field), May_Moisture_index (Abacus); MI_Jun (Field), Jun_Moisture_index (Abacus); MI_Jul (Field), Jul_Moisture_index (Abacus); MI_Aug (Field), Aug_Moisture_index (Abacus) MI_Sep (Field), Sep_Moisture_index (Abacus); MI_Oct (Field), Oct_Moisture_index (Abacus); MI_Nov (Field), Nov_Moisture_index (Abacus); MI_Dec (Field), Dec_Moisture_index (Abacus); MI_Year (Field), year_mean_moisture_index (Abacus).

Nature: Default
Type: Number field
Values: default values

Description: The Moisture index for each month is calculated using the following equation from Mather and Yoshioka (p.76, 1973):

MI = ((Mean precipitation / mean PE) -1) * 100

A4.65. *"Productivity? NDVI*

Internal name: NDVI_Jan (Field); NDVI_Feb (Field); NDVI_Mar (Field); NDVI_Apr (Field); NDVI_May (Field); NDVI_Jun (Field); NDVI_Jul (Field); NDVI_Aug (Field); NDVI_Sep (Field); NDVI_Oct (Field); NDVI_Nov (Field); NDVI_Dec (Field); NDVI_Year (Field).

Nature: Optional
Type: Number field
Values: any

Description: The NDVI (Normalized Difference Vegetation Index) data are derived from satelite measurements of reflectivity in ceratin wavelengths, which is then calibrated to vegetation cover. It hasbeen shown to be a relatively good measure of surface primary productivity (see introduction to this section).

A4.66. *Mean annual NDVI*

Internal name: NDVI_mean_annual (Field), NDVI_mean_annual (Abacus)

Nature: Optional
Type: Number field and abacus
Values: any

Description: The mean annual NDVI calcuated by taking the average of monthly values.

A4.67. *Maximum NDVI*

Internal name: NDVI_Maximum (Field), NDVI_Maximum (Abacus)

Nature: Optional
Type: Number field and abacus
Values: any

Description: The maximum monthly NDVI calcuated by taking the month with the maximum NDVI value.

A4.68. *Minimum NDVI*

Internal name: NDVI_minimum (Field), NDVI_minimum (Abacus)

Nature: Optional
Type: Number field and abacus
Values: any

Description: The minimum NDVI calcuated by taking the month with the minimum NDVI value.

A4.69. *Annual Range NDVI*

Internal name: NDVI_annual_range (Field), NDVI_annua_range (Abacus)

Nature: Optional
Type: Number field and abacus
Values: any

Description: The annual range of NDVI calcuated by taking the difference between the month with the maximum NDVI value and that with the minimum.

A4.70. *Median NDVI*

Internal name: NDVI_median (Field), NDVI_median (Abacus)

Nature: Optional

Type: Number field and abacus
Values: any

Description: The median NDVI calcuated by taking the median of all monthly values.

A4.71. *1 SD NDVI*

Internal name: NDVI 1 SD (Field), NDVI 1 SD (Abacus)

Nature: Optional
Type: Number field and abacus
Values: any

Description: A single standard deviation about the mean NDVI.

A4.72. *REF#*

Internal name: REF#1 (Field)

Nature: Optional
Type: Number field
Values: any

Description: The reference number for the reference used in this entry form.

A4.73. *Reference abbreviation*

Internal name: Lookup REF#1 (Abacus)

Nature: Default
Type: Number abacus
Values: default

Description: The reference abbreviation is automatically defined by the database on entry of the applicable reference # in the preceding field.

A4.74. *page#*

Internal name: page#1 (Field),

Nature: Optional
Type: Number field
Values: any

1046

Description: The page numbers for the reference used.

A5. ENTER TAXA BY LOCALITY

Relation: ***MAIN TAXA BY LOCALITY***

Unique record identifier: ***The combination of LOCALITY# and TAXON#.***

Menu Location: ♦***DATA ENTRY***♦

Accessibilty: ***PROGRAMMER and DATA ENTRY***

This entry form links the taxon to the localities in which it occurs using the ***Locality#*** from **ENTER LOCALITIES** and ***Taxon#*** from **ENTER MAIN TAXONOMY**. Once these entries are made the link is established. However this form allows qualification of the link to be made. Minor synonymies, taxonomic qualifications (aff., cf., etc.) are dealt with here, as is a summary of the specimen material represented, where this is given in the reference.

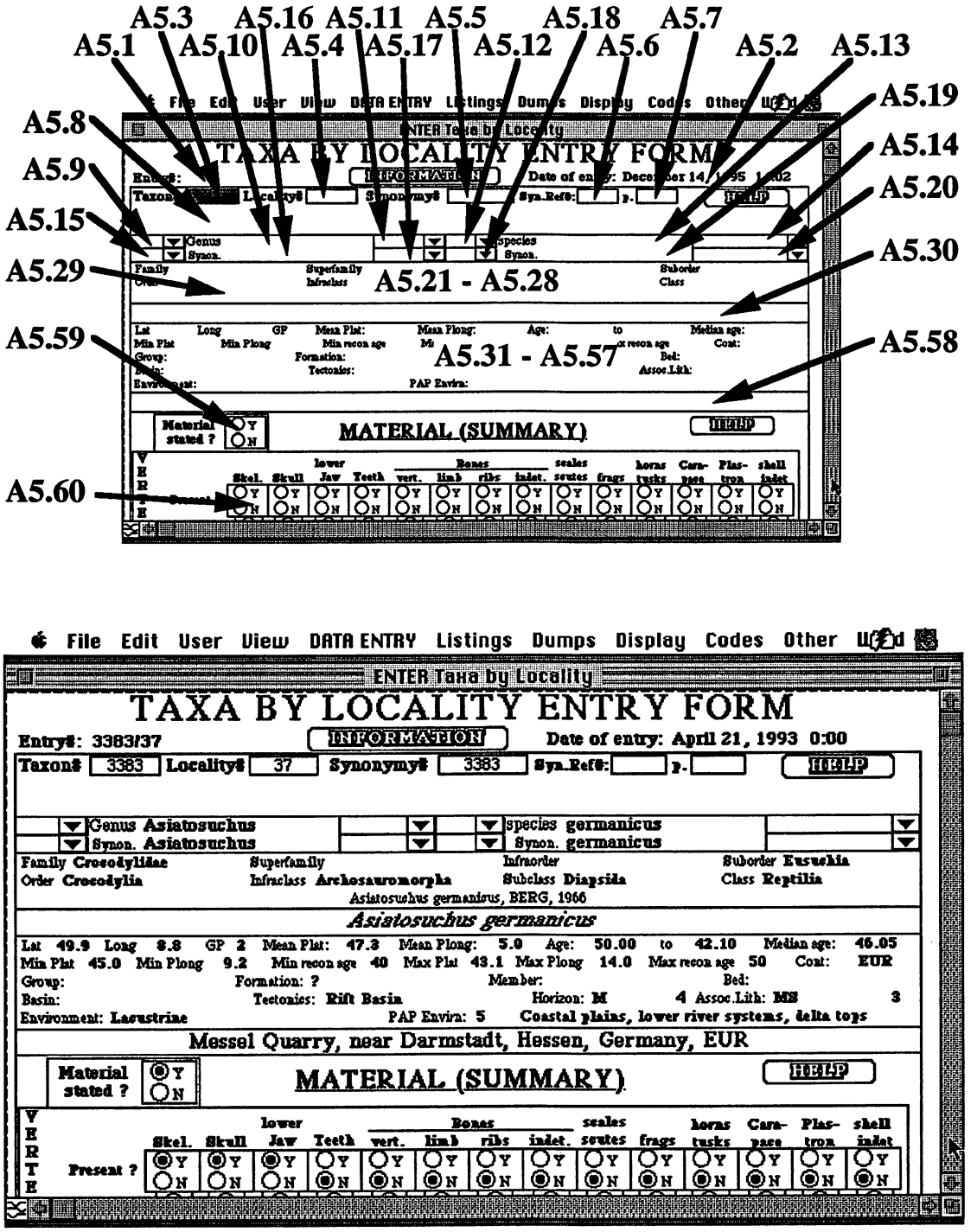


FIGURE A4.09. Screen pictures of the principal entry form in the 'Main Taxa by Locality' relation.

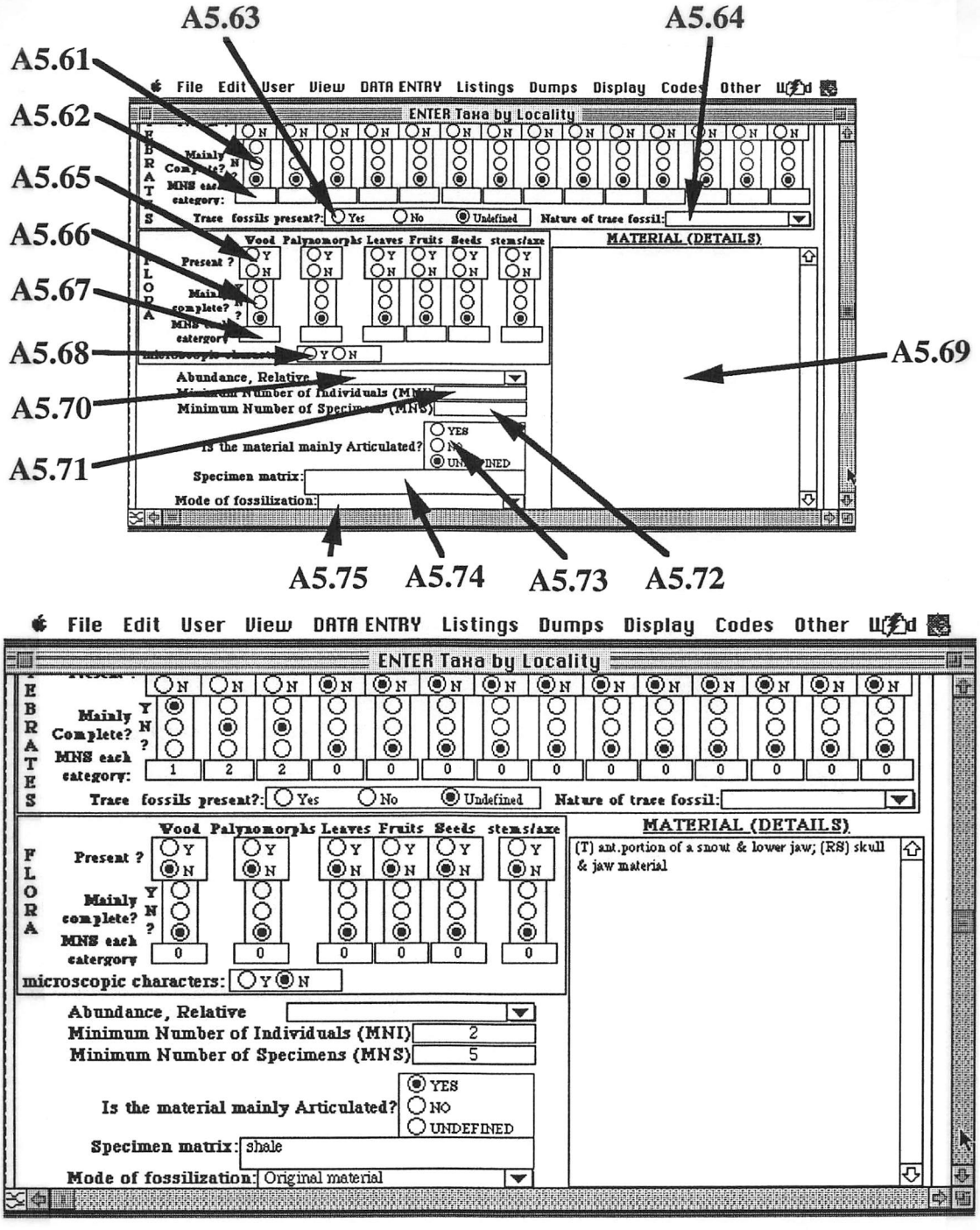


FIGURE A4.09., continued.

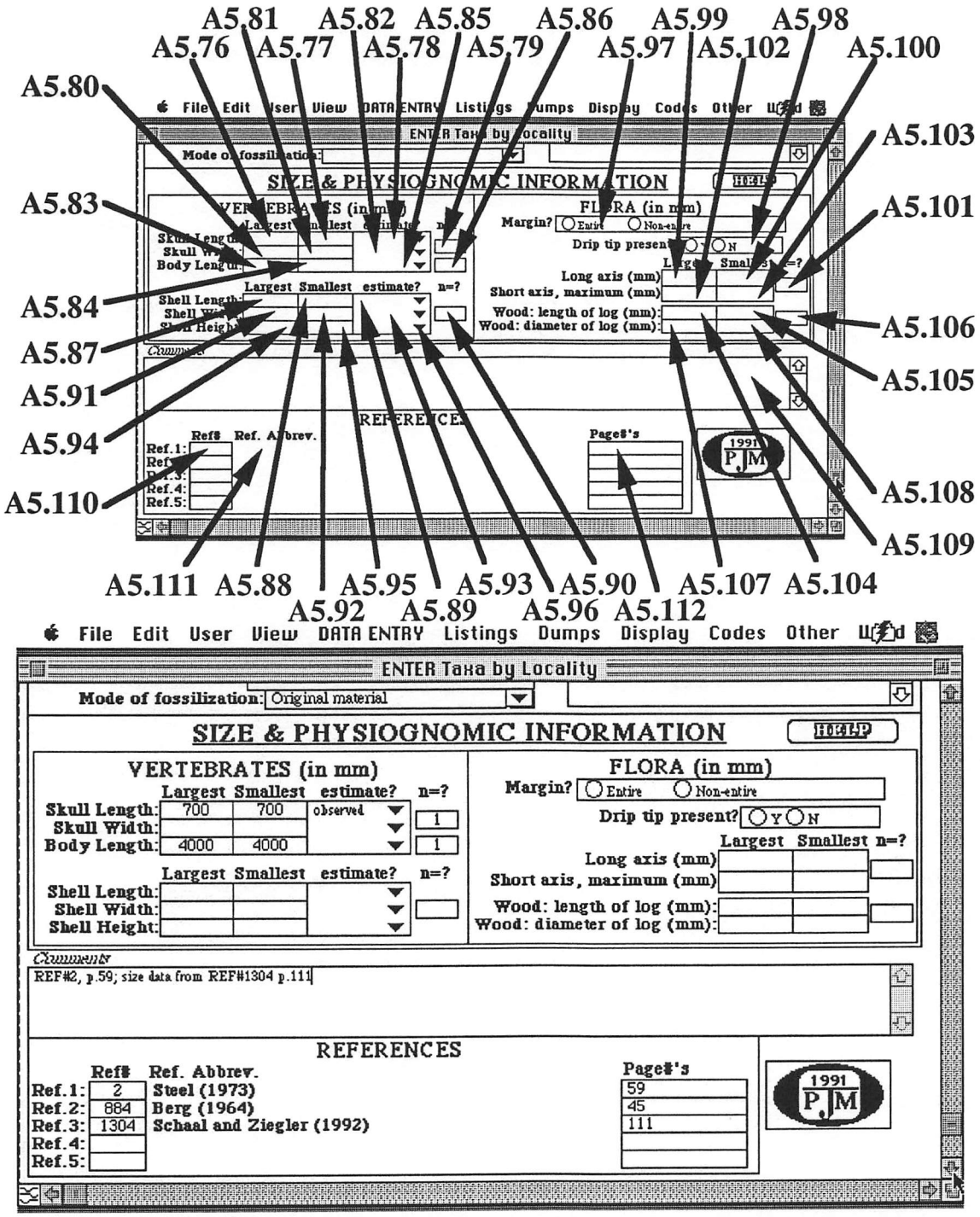


FIGURE A4.09., continued.

A4.1. *Entry#*

Internal name: Entry# (TbyL) (Field), Entry# (TbyL) (Abacus)

Nature: MANDATORY
Type: Number field and abacus
Values: Default only

Description: The unique number that represents each record in the ***THE TAXA BY LOCALITY*** relation. This is concatenating the taxon# and locality# together, separated by a slash.

A4.2. *Date entered*

Internal name: Date data originally entered (Field), Form Time (Abacus)

Nature: MANDATORY
Type: Date field
Values: Default on record being initiated

Description: The date on which the record was first defined. The database automatically defiens this field when any value when the record is first entered into the collection (i.e. when the <RETURN> key is pressed

A5.3. *Taxon#*

Internal name: Taxon# (Field)

Nature: MANDATORY[29]
Type: Number field
Values: The taxon number from the **ENTER MAIN TAXA** for the taxon represented.

Description: The unique number that represents the taxon which is to be entered.

HELP: On entry the computer will automatically write the name of the genus and species in the non-selectable fields next to the headings **Genus** and **species**. The computer will also lookup and write out the Family, Order and Class names appropriate to the taxon. This provides a means of checking that the correct taxon number, appropriate to the taxon you wish to link to the locality, has been entered.

---

29. This is a validated field. It must be defined. If this criterion is not met, the computer will make an audible error sound and prevent tabbing to subsequent fields.

A5.4. *Locality#*

Internal name: Locality# (Field)

Nature: MANDATORY[30]
Type: Number field
Values: The locality number from the ENTER LOCALITY DATA for the locality in which the taxon occurs.

Description: The unique number that represents the locality at which the designated taxon occurs.

HELP: On entry the computer will automatically write the name of the locality in the non-selectable fields next to the heading **Locality Name**. The computer will also lookup and write out the Formation and member names appropriate for the locality entered.

* * * * * *

Once these two entries are made a link between the taxon and the locality in which it occurs is established.

* * * * * *

A5.5. *Synonymy#*

Internal name: Synonymy# (Field), Find synonymy#3 if defined (Abacus)

Nature: Optional (Defaulted field)
Type: Number field and abacus
Values: The taxon number from the ENTER LOCALITY DATA for the synonymized form of the entry in the ***Taxon#*** field.

Description: The taxon number from the ENTER LOCALITY DATA for the synonymized form of the entry in the ***Taxon#*** field. If the taxon number is synonymised to another in the ***MAIN TAXONOMY*** relation the database automatically enters the synonymy here. If that synonymy itself is in turn synonymized, again the database takes this into account.

HELP: This is for 'minor' or 'local' synonymies only, i.e. synonymies that apply to this taxon at this specific locality and not necessarily any where else. The default is the number entered in the ***Taxon#*** field (A5.3). On entry the computer will automatically write the name of the synonymized genus and species in the non-selectable fields next to the headings **Synonymized Genus** and **Synonymized species**.

A5.6. *Ref Synonymy*

30. This is a validated field. It must be defined. If this criterion is not met, the computer will make an audible error sound and prevent tabbing to subsequent fields.

Internal name: Syn_reference (Field), Find Syn ref for Taxon# (Abacus)

Nature: Optional
Type: Number field and abacus
Values: any integer (appropriate Ref#)

Description: The reference number appropriate to the reference in the ***MAIN REFERENCES*** relation in which the synonymy is recognized. If this is aready defined for the Taxon# the database will automatically define this field.

HELP: Use the **LIST REFERENCES** listing from the ♦**LISTINGS**♦ menu to help find the Ref # you need.

A5.7. *Ref Synonymy page#'s*

Internal name: Syn_reference_page# (Field), Find Syn p's for Taxon# (Abacus)

Nature: Optional
Type: Text field and abacus
Values: any

Description: The page number(s) for the reference in which the synonymy is recognized. The database will automatically define this field if appropriate.

A5.8. *Synonymy message* (unlabeled field)

Internal name: Message_if_synonymy_suggested (Abacus)

Nature: Default
Type: Text abacus
Values: default only

Description: It the taxon entered via the **Taxon#** field is synonymized, the database will automatically provide a message explaing this synonymy, and what action the database has done (whether it has included this synonymy in this relation as well). The synonymies automatically made by the database can be overruled where appropriate and this is explained in this message.

A5.9. *cf.* (Taxon name qualifier, unlabeled field)

Internal name: cf.1 (taxon certainty)

Nature: Optional
Type: Text field (static pop-up menu)
Values: any. Options available: ?, aff., cf.

Description: For qualifying the assignment of the taxon name.

HELP: If defined the computer will use this with the taxon name in any lists. e.g. ?Homo sapiens

A5.10. *Genus*

Internal name: Genus (field), Find Genus (abacus)

Nature: Optional (defaulted field)
Type: Text field and abacus
Values: default only

Description: Genus name for taxon # entered in ***Taxon#***

HELP: The computer will automatically define this field based on the entry in the ***Taxon#*** field. It is non-selectable.

A5.11. *cf.* (Genus name qualifier, unlabeled field)

Internal name: cf.2 (genus certainty) (field)

Nature: Optional
Type: Text field (static pop-up menu)
Values: any. Options available: ?

Description: For qualifying the assignment of the Genus name.

HELP: If defined the computer will use this with the taxon name in any lists. e.g. Homo? sapiens.

A5.12. *cf* (species name qualifier, unlabeled field)

Internal name: cf.3 (species certainty) (Field)

Nature: Optional
Type: Text field (static pop-up menu)
Values: any. Options available: ?, aff., cf.

Description: For qualifying the assignment of the species name.

HELP: If defined the computer will use this with the taxon name in any lists. e.g. Homo ?sapiens.

A5.13. *species*

Internal name: Species (field), Find Species (abacus)

Nature: Optional (defaulted field)
Type: Text field and abacus
Values: default only

Description: Species name for taxon # entered in ***Taxon#***

HELP: The computer will automatically define this field based on the entry in the ***Taxon#*** field. It is non-selectable.

A5.14. *?* (taxon name qualifier 2, unlabeled field)

Internal name: cf.4 (Field)

Nature: Optional
Type: Text field (static pop-up menu)
Values: any. Options available: ?, A, B, C, D, nov., sp. & gen. nov., (large), (small)

Description: For qualifying the assignment of the taxon name.

HELP: If defined the computer will use this with the taxon name in any lists. e.g. Homo sp. A, Homo sp. (large).

A5.15. *cf.* (Taxon name qualifier, unlabeled field)

Internal name: cf.1 (syn)(taxon certainty) (Field), Default for cf.1 (syn) (Abacus)

Nature: Optional (default)
Type: Text field (static pop-up menu)
Values: any. Options available: ?, aff., cf.; the default is what ever was enered in field A5.9.

Description: For qualifying the assignment of the synonymy name.

HELP: If defined the computer will use this with the taxon name in any lists. e.g. ?Homo sapiens

A5.16 *Synonymized Genus*

Internal name: Syn_Genus (field), Find_Syn_Genus (abacus)

Nature: Optional (defaulted field)
Type: Text field and abacus
Values: default only

Description: Synonymized genus name for taxon # entered in ***Taxon#***

HELP: The computer will automatically define this field based on the entry in the ***Taxon#*** field. It is non-selectable.

A5.17. *cf.* (Syn Genus name qualifier, unlabeled field)

Internal name: cf.2_(syn)(genus_certainty) (field), Default_for_cf.2_(syn) (Abacus)

Nature: Optional (default)
Type: Text field (static pop-up menu) and abacus
Values: any. Options available: ?; the default is what ever was enered in field A5.11.

Description: For qualifying the assignment of the synonymy's senus name.

HELP: If defined the computer will use this with the taxon name in any lists. e.g. Homo? sapiens.

A5.18. *cf* (Syn species name qualifier, unlabeled field)

Internal name: cf.3_(syn)(species_certainty) (Field), Default_for_cf.3_(syn) (Abacus)

Nature: Optional (default)
Type: Text field (static pop-up menu) and abacus
Values: any. Options available: ?, aff., cf.; the default is what ever was enered in field A5.12.

Description: For qualifying the assignment of the synonymy's species name.

HELP: If defined the computer will use this with the taxon name in any lists. e.g. Homo ?sapiens.

A5.19. *Synonymized species*

Internal name: Syn_Species (field), Find_Syn_Species (abacus)

Nature: Optional (defaulted field)

Type: Text field and abacus
Values: default only

Description: Synonymized species name for taxon # entered in ***Taxon#***

HELP: The computer will automatically define this field based on the entry in the ***Taxon#*** field. It is non-selectable.

A5.20. *?* (syntaxon name qualifier 2, unlabeled field)

Internal name: cf.4 (syn) (Field), Default for cf.4 (syn) (Abacus)

Nature: Optional (default)
Type: Text field (static pop-up menu) and abacus
Values: any. Options available: ?, A, B, C, D, nov., sp. & gen. nov., (large), (small); the default is what ever was enered in field A5.14.

Description: For qualifying the assignment of the synonymy's name.

HELP: If defined the computer will use this with the taxon name in any lists. e.g. Homo sp. A, Homo sp. (large).

In order to facilitate searches and links between relations certain data for each locality (A5.31-A5.58) and taxon (A5.21-A5.28) are imported from the ***MAIN LOCALITY*** and ***MAIN TAXONOMY*** relations, respecively. All of these fields are therefore default fields defined by the databse. Since this information has already been described elsewhere only the name of the field and abacus are given.

A5.21. *Family*

Internal name: MAIN Family (Taxa by Loc) (field), Find MAIN Family (abacus)

A5.22. *Superfamily*

Internal name: MAIN Superfamily (Taxa by Loc) (field), Find MAIN Superfamily (abacus)

A5.23. *Infraorder*

Internal name: MAIN Infraorder (Taxa by Loc) (field), Find MAIN Infraorder (abacus)

A5.24. *Suborder*

Internal name: MAIN Suborder (Taxa by Loc) (field), Find MAIN Suborder (abacus)

A5.25. *Order*

Internal name: MAIN Order (Taxa by Loc) (field), Find MAIN Order (abacus)

A5.26. *Infraclass*

Internal name: MAIN Infraclass (Taxa by Loc) (field), Find MAIN Infraclass (abacus)

A5.27. *Subclass*

Internal name: MAIN Subclass (Taxa by Loc) (field), Find MAIN Subclass (abacus)

A5.28. *Class*

Internal name: MAIN Class (Taxa by Loc) (field), Find MAIN Class (abacus)

A5.29. *Genus/species/syn Describer (=Synonymy Describer)* (unnamed field)

Internal name: Genus/species/syn Describer (=synonymy describer) (Abacus)

Nature: Default
Type: Text abacus
Values: default only

Description: Taxon name for taxon # entered in ***Taxon#*** with qualifiers, describers and synonymy if appropriate

HELP: The computer will automatically define this field based on the entry in the ***Taxon#*** field and the associated qualifiers defined. It is non-selectable.

A5.30. *Genus/species/syn* (unnamed field)

Internal name: Genus/species/syn (Abacus)

Nature: Default
Type: Text abacus
Values: default only

Description: Taxon name for taxon # entered in ***Taxon#*** with qualifiers. Basically the same as for A5.28 but without the describers shown

HELP: The computer will automatically define this field based on the entry in the ***Taxon#*** field and the associated qualifiers defined. It is non-selectable.

A5.31. *Latitude*

Internal name: Latitude (field), Find Latitude (abacus)

A5.32. *Longitude*

Internal name: Longitude (field), Find Longitude (abacus)

A5.33. *Geographic Precision*

Internal name: Geographic Precision (field), Find Geog.Precision (abacus)

A5.34. *Mean palaeolatitude*

Internal name: Mean Plat (field), Find Mean Plat for Loc# (abacus)

A5.35. *Mean palaeolobitude*

Internal name: Mean Plong (field), Find Mean Plong for Loc# (abacus)

A5.36. *Age range (lower bound)*

Internal name: Age(Ma) bot (field), Find Btm age for loc (abacus)

A5.37. *Age range (upper bound)*

Internal name: Age(Ma) top (field), Find Top age for loc (abacus)

A5.38. *Minimum palaeolatitude*

Internal name: Min Plat (field), Find Min PLat for Loc# (abacus)

A5.39. *Minimum palaeolongitude*

Internal name: Min Plong (field), Find Min Plong for Loc# (abacus)

A5.40. *Minimum reconstruction age*

Internal name: Min recon age (field), Find Min Recon age for Loc# (abacus)

A5.41. *Maximum palaeolatitude*

Internal name: Max Plat (field), Find Max PLat for Loc# (abacus)

A5.42. *Maximum palaeolongitude*

Internal name: Max Plong (field), Find Max Plong for Loc# (abacus)

A5.43. *Maximum reconstruction age*

Internal name: Max recon age (field), Find Max Recon age for Loc# (abacus)

A5.44. *Continent*

Internal name: Continent (field), Find Cont.code (abacus)

A5.45 *Group*

Internal name: Group (field), Find Group for Loc# (abacus)

A5.46 *Formation*

Internal name: Formation (field), Find Formation (abacus)

A5.47 *Member*

Internal name: Member (field), Find Member (abacus)

A5.48 *Bed*

Internal name: Bed (field), Find Bed (abacus)

A5.49 *Basin*

Internal name: Basin (field), Find Basin (abacus)

A5.50 *Tectonics*

Internal name: Tectonics (field), Find Tectonics (abacus)

A5.51 *Horizon Lithology (PAP)*

Internal name: PAP lith horizon code (field), Find PAP (horiz) lith code (abacus)

A5.52 *Horizon Lithology summary code (PAP)*

Internal name: PAP lith (horiz) summ (field), Find PAP (horiz) lith summ (abacus)

A5.53 *Associated Lithology (PAP)*

Internal name: PAP lith codes (field), Find PAP lith codes (abacus)

A5.54 *Associated Lithology summary code (PAP)*

Internal name: PAP lith summary (field), Find PAP Lith summ (abacus)

A5.55 *Environment*

Internal name: Environmental summary (field), Find Envirn summary for Loc# (abacus)

A5.56 *PAP Environmental code*

Internal name: PAP Envirn Code (Taxa by Loc) (field), Find Envirn Code (abacus)

A5.57 *PAP Environment* (unlabeled field)

Internal name: PAP Environment (Taxa by Loc) (field), Find PAP Environment (abacus)

A5.58. *Locality Name*

Internal name: Find Locality Name (Abacus)

Nature: Optional (defaulted field)
Type: Text abacus
Values: default only

Description: Locality name for locality # entered in ***Locality#***

HELP: The computer will automatically define this field based on the entry in the ***Locality#*** field. It is non-selectable.

The remaining fields in this entry form store information concerning the specimens themselves. Information that can be used for large scale taphonomic issues, size bias etc.

A5.59. *Material stated?*

Internal name: Material Not stated (field), Default for material stated (abacus)

Nature: Optional (Defaulted field)
Type: Flag field
Values: Yes (Y) or No (N). Default is no.

Description: Whether specimen material for this taxon is given. If No then the database will automatically enter 1 in each of the fields ***Minimum Number of Individuals (MNI)***and

Minimum Number of Specimens (MNS). If Yes then the database will enter)'s in the fields representing the minimum number of specimens in each of the specimen categories.

In order to record a summary of specimen information, vertebrate specimens are divided into the following categories:

Skeleton (**Skel.**)	if a 'skeleton' is described
Skull (**Skull**)	if a skull or any part of the skull is described
Lower jaw (**lower jaw**)	if a lower jaw or any part thereof is described.
Teeth (**Teeth**)	if teeth are described
Vertebrae (**Bones vert.**)	if vertebrae are described
Limbs (**Bones limb**)	if limbs or any part thereof are described
Ribs (**Bones ribs**)	if ribs are described
indeterminate bones (**Bones indet.**)	
scales or scutes (**scales scutes**)	if scales or scutes are described
indeterminate fragments (**frag.**)	if indeterminate fragments are described
horns or tusks (**horns tusks**)	if horns or tusks are described
carapace (**carapace**)	if carapace or parts thereof are described
plastron (**plastron**)	if the plastron or parts thereof are described
shell indeterminate (**shell indet.**)	if shells are described without specifying the plastra or carapace

For each of these categories are fields in which to record the presence or absence of each specimen group, the general condition of the specimens in each group (whether they are basically complete or fragmentary) and also the minimum number of specimens in each category. The nature of each field type is summarized below.

A5.60. *Present ?*

Internal name: [x][31] **Present** (field), **Default Present** (abacus)

Nature: Optional (Defaulted field)
Type: Flag field and abacus (Radio buttons)
Values: Yes (**Y**) or No (**N**)

Description: If specimens for this category are present or absent.

HELP: If the field ***Material stated ?*** is defined as Yes (Y) then the ***Present ?*** fields default to No (N) until changed to Yes (Y) where appropriate).

---

31. x represents any of the categories, e.g. the firld name for the presence of skulls is **skull Present**

A5.61. *Mainly complete ?*

Internal name: Complete [x]?[1]

Nature: Optional (Defaulted field)
Type: Flag field and abacus (radio buttons)
Values: Yes (**Y**), No (**N**) or unknown (**?**)

Description: If specimens for this category are mainly complete or incomplete. The default for these fields is for them to be unspecified (?).

A5.62. *MNS each category*

Internal name: Min No of [x][1]specs (field), If [x][1] pres N then 0 (abacus)

Nature: Optional (Defaulted field)
Type: Number field and abacus
Values: any integer

Description: Number of specimens in each category.

HELP: If the ***Material Present*** field is defined Yes then the default for these fields is automatically 0 until changed. The computer will automatically sum the values in these fields an place the total in the ***Minimum number of specimens*** field.

Additionl foosil data can also be included, for instance trace fossil information. The inclusion of this field here in the vertebrate section reflects the importance of especially foot prints as sources of palaeoecological data.

A5.63. *Trace fossils present?*

Internal name: Trace fossil present? (Field)

Nature: Optional
Type: Flag field (radio buttons)
Values: Yes (**Y**), No (**N**) or unknown (**?**)

Description: Trace fossil data, especially footprints. Eggshell also may be included here.

A5.64. *Nature of traces?*

Internal name: Nature of Trace (Field)

Nature: Optional
Type: Text field (static popup)

Values: any

Description: The type of trace evidence present.

Although originally set up for verebrate information the databas enow also houses floral data. To reflect this specimen data fields are also provided for palaebotanical information as follows:

Wood	any fossil wood fragments, logs, stumps etc.
palynomorphs	pollen
leaves	fossil leaves (macroflora)
fruits	fruitifications
seeds	seeds (mesoflora)
stems/axes	stems, twigs, indeterminate material

For each of these categories are fields in which to record the presence or absence of each specimen group, the general condition of the specimens in each group (whether they are basically complete or fragmentary) and also the minimum number of specimens in each category. The nature of each field type is summarized below.

A5.65. *Present ?*

Internal name: [x][32] **Present** (field), **Default Present** (abacus)

Nature: Optional (Defaulted field)
Type: Flag field and abacus (Radio buttons)
Values: Yes (**Y**) or No (**N**)

Description: If specimens for this category are present or absent.

HELP: If the field ***Material stated ?*** is defined as Yes (Y) then the ***Present ?*** fields default to No (N) until changed to Yes (Y) where appropriate).

A5.66. *Mainly complete ?*

Internal name: **Complete [x]?**[1]

Nature: Optional (Defaulted field)
Type: Flag field and abacus (radio buttons)
Values: Yes (**Y**), No (**N**) or unknown (**?**)

---

32. x represents any of the categories, e.g. the firld name for the presence of skulls is **skull Present**

Description: If specimens for this category are mainly complete or incomplete. The default for these fields is for them to be unspecified (?).

A5.67. *MNS each category*

Internal name: Min No of [x][1]specs (field), If [x][1] pres N then 0 (abacus)

Nature: Optional (Defaulted field)
Type: Number field and abacus
Values: any integer

Description: Number of specimens in each category.

HELP: If the ***Material Present*** field is defined Yes then the default for these fields is automatically 0 until changed. The computer will automatically sum the values in these fields an place the total in the ***Minimum number of specimens*** field.

In order to faciliate palaeoclimate investigations using leaf physiognomic methods, it is planned to include a seres of presence/absence buttons with leaf morphologies shown, for instance, entire, drip tip, etc. The use of pictures showing the physiognomic features on them would provide the least confusing means of inticing users to enter such information.

A5.68. *microscopic characters*

Internal name: microscopic characters (field), Default Present (abacus)

Nature: Optional (Defaulted field)
Type: Flag field and abacus (Radio buttons)
Values: Yes (**Y**) or No (**N**)

Description: Microscopic features are recognizable on specimens

A5.69. *Material (Details)*

Internal name: Specimen Type (Field)

Nature: Optional
Type: Text field (keyword field)
Values: Any

Description: Further details concerning specimens if desired. As a keyword field searches may be rapidly made on any entries in this field, for example the database could be sorted for all occurrences which contain ilia. Because there is no preset size limit this field could also be used to store specimen numbers against each specimen record.

A5.70. *Abundance, Relative*

Internal name: Relative abundance

Nature: Optional
Type: Text field (pop-up menu)
Values: any. Available options:
Abundant
Common
Rare

Description: Relative abundance of taxon at specified locality.

A5.71. *Minimum Number if Individuals (MNI)*

Internal name: Abundance, MNI (field), If material pres then MNI is (abacus)

Nature: Optional (Defaulted field)
Type: Number field and abacus
Values: any integer

Description: Minimum number of individuals at the locality for the taxon specified. If the field ***Material stated ?*** is defined 'No' this field defaults to 1.

A5.72. *Minimum Number if Specimens (MNS)*

Internal name: Abundance, #specimens (field), If material present then #MNS is (abacus)

Nature: Optional (Defaulted field)
Type: Number field and abacus
Values: any integer

Description: Minimum number of specimens at the locality for the taxon specified.

HELP: If the field ***Material stated ?*** is defined 'No' this field defaults to 1. If the ***Material stated ?*** field is defined 'Yes' then this field is automatically filled with the sum of all of the ***MNS each category*** fields. If a pleural is used the minimum number of specimens entered is '2', e.g. 'teeth' should be entered as "2".

A5.73. *Is the material mainly articulated?*

Internal name: **Articulated/Disarticulated** (Field)

Nature: Optional (Defaulted field)
Type: Flag field (radio buttons)
Values: 'Yes', 'No', 'Undefined'

Description: For degree of articulation of specimens of this taxon at this locality. The default is 'Undefined'

A5.74. *Specimen matrix*

Internal name: **Specimen_matrix** (Field)

Nature: Optional
Type: Text field
Values: any

Description: The lithology of the matric in which the specimen is directly embedded.

HELP: This may not be the same as the horizon lithology entered for the locality in the ***MAIN LOCALITY*** relation. For example, the specimen may occur within a carbonate concretion in a bed of shale. Shale would be entered in the ***MAIN LOCALITY*** relation, while "carbonate concretion" would be entered here as the specimen matrix.

A5.75. *Mode of fossilization*

Internal name: **Nature_of_preservation** (Field), **Default_preservation** (Abacus)

Nature: Optional (Defaulted field)
Type: Text field (static popup)
Values: any; menu gives the following:

Carbonized
Cast
Compression
External cast
External mold
Haematized
Impression
Impression (fottprint)
Internal cast
Internal mold
Original material
Permineralized
Petrification
Pyritized
Silicification
Unspecified

Description: The mode of preservation of the specimen. The default is "unspecified". In most cases this information is unfortunately not specified.

The final series of entry fields is for size and physiognomic information. These are only very general since it is unrealistic to try and record the size information for all specimens. It is also unclear of what use she information would be for palaeoecology and palaeoclimate studes, except as a further indication of the influence of taphonomy...if any further indication were required.

A5.76. *Skull length largest*

Internal name: Largest Skull Length

Nature: Optional
Type: Number field
Values: any integer

Description: Maximum skull length (maximum anterior - posterior measurement) in millimetres.

A5.77. *Skull length smallest*

Internal name: Smallest Skull Length (field), If skull length max defined (abacus)

Nature: Optional (Defaulted field)
Type: Number field
Values: any integer

Description: Minimum skull length (maximum anterior - posterior measurement) in millimetres. Default is the same as the value entered in the ***Skull length largest field.***

A5.78. *Estimate of observation?*

Internal name: Estimated? Skull length (field), Default sk len estimate? (abacus)

Nature: Optional (Defaulted field)
Type: Text field (static popup)
Values: menu options only: either "estimated" or "oberved"

Description: The size information recorded is often based only on incomplete specimens. This field allows the size allocation to be qualified.

A5.79. *n=? skulls*

Internal name: n=? for skull (field), Defaulted n for skulls (abacus)

Nature: Optional (Defaulted field)
Type: Number field
Values: any integer

Description: Number of skulls from which the skull measurements were taken. Default is 1.

A5.80. *Skull width largest*

Internal name: Largest Skull Width

Nature: Optional
Type: Number field
Values: any integer

Description: Maximum skull width in millimetres.

A5.81. *Skull width smallest*

Internal name: Smallest Skull Width (field), If skull width max defined (abacus)

Nature: Optional (Defaulted field)
Type: Number field
Values: any integer

Description: Minimum skull width in millimetres. Default is the same as the value entered in the ***Skull width largest field.***

A5.82. *Estimate of observation?*

Internal name: Estimated? Skull width (field), Default sk wid estimate? (abacus)

Nature: Optional (Defaulted field)
Type: Text field (static popup)
Values: menu options only: either "estimated" or "oberved"

Description: The size information recorded is often based only on incomplete specimens. This field allows the size allocation to be qualified.

A5.83. *Body length largest*

Internal name: Largest Body length (Field)

Nature: Optional
Type: Number field
Values: any integer

Description: Maximum body length (maximum anterior - posterior measurement) in millimetres.

A5.84. *Body length smallest*

Internal name: Smallest Body length (field), If body length max defined (abacus)

Nature: Optional (Defaulted field)
Type: Number field
Values: any integer

Description: Minimum body length in millimetres. Default is the same as the value entered in the ***Body length largest*** field.

A5.85. *Estimate of observation?*

Internal name: Estimated? Body length (field), Default body len estimate? (abacus)

Nature: Optional (Defaulted field)
Type: Text field (static popup)
Values: menu options only: either "estimated" or "oberved"

Description: The size information recorded is often based only on incomplete specimens. This field allows the size allocation to be qualified.

A5.86. *n=? bodies*

Internal name: n=? for body (field), Defaulted n for body (abacus)

Nature: Optional (Defaulted field)
Type: Number field
Values: any integer

Description: Number of skeletons from which the body length measurements were taken. Default is 1.

A5.87. *shell length largest*

Internal name: Largest Shell length (Field)

Nature: Optional
Type: Number field
Values: any integer

Description: Largest shell length (maximum posterior-anterior measurement) in millimetres.

A5.88. *Shell length smallest*

Internal name: Smallest Shell length (field), If shell length max defined (abacus)

Nature: Optional (Defaulted field)
Type: Number field
Values: any integer

Description: Smallest shell length (maximum posterior-anterior measurement) in millimetres. Default is the same as entry in the ***Shell length largest*** field.

A5.89. *Estimate of observation?*

Internal name: Estimated? Shell length (field), Default shell len estimate? (abacus)

Nature: Optional (Defaulted field)
Type: Text field (static popup)
Values: menu options only: either "estimated" or "oberved"

Description: The size information recorded is often based only on incomplete specimens. This field allows the size allocation to be qualified.

A5.90. *n=? shells*

Internal name: n=? for shells (field), Defaulted n for shells (abacus)

Nature: Optional (Defaulted field)
Type: Number field
Values: any integer

Description: Number of shells from which the shell measurements were taken. Default is 1.

A5.91. *Shell width largest*

Internal name: Largest Shell width

Nature: Optional
Type: Number field
Values: any integer

Description: Largest shell width in millimetres.

A4.92. *Shell width smallest*

Internal name: Smallest Shell width (field), If shell width max defined (abacus)

Nature: Optional (Defaulted field)
Type: Number field
Values: any integer

Description: Smallest shell width in millimetres. Default is the same as entry in the ***Shell width largest*** field.

A5.93. *Estimate of observation?*

Internal name: Estimated? Shell width (field), Default shell wid estimate? (abacus)

Nature: Optional (Defaulted field)
Type: Text field (static popup)
Values: menu options only: either "estimated" or "oberved"

Description: The size information recorded is often based only on incomplete specimens. This field allows the size allocation to be qualified.

A5.94. *Shell height largest*

Internal name: Largest Shell height (Field)

Nature: Optional
Type: Number field
Values: any integer

Description: Largest shell height (maximum dorso-ventral measurement) in millimetres.

A5.95. *Shell height smallest*

Internal name: Smallest Shell height (field), If shell height max defined (abacus)

Nature: Optional (Defaulted field)
Type: Number field
Values: any integer

Description: Smallest shell height (maximum dorso-anterior measurement) in millimetres. Default is the same as entry in the ***Shell height largest*** field.

A5.96. *Estimate of observation?*

Internal name: Estimated? Shell height (field), Default shell hei estimate? (abacus)

Nature: Optional (Defaulted field)
Type: Text field (static popup)
Values: menu options only: either "estimated" or "oberved"

Description: The size information recorded is often based only on incomplete specimens. This field allows the size allocation to be qualified.

A5.97. *Leaf margin?*

Internal name: Leaf margin (field)

Nature: Optional
Type: Flag field (radio buttons)
Values: "Entire," "Non-entire"

Description: Whether the preserved leaf specimen has an entire or non-entire margin.

A5.98. *Drip tip present?*

Internal name: Drip tip present? (field)

Nature: Optional
Type: Flag field (radio buttons)
Values: "Y" = yes, "N" = no

Description: Whether the preserved leaf specimen has a drip tip.

A5.99. *Largest Long axis, mm*

Internal name: Leaf largest long axis (field)

Nature: Optional
Type: Number field
Values: any

Description: The length of the long axis of the leaf, in millimetres. The largest measurement made for this taxon at this locality.

A5.100. *Smallest Long axis, mm*

Internal name: Leaf smallest long axis (field)

Nature: Optional
Type: Number field
Values: any

Description: The length of the long axis of the leaf, in millimetres: the smallest measurement made for this taxon at this locality.

A5.101. *n=? leaves*

Internal name: n=? for leaves (field), Defaulted n for leaves (abacus)

Nature: Optional (Defaulted field)
Type: Number field
Values: any integer

Description: Number of leaves from which the leaf measurements were taken. Default is 1.

A5.102. *Largest Short axis, mm*

Internal name: Leaf largest short axis (field)

Nature: Optional
Type: Number field
Values: any

Description: The length of the short axis of the leaf, in millimetres. The largest measurement made for this taxon at this locality.

A5.103. *Smallest Short axis, mm*

Internal name: Leaf smallest short axis (field)

Nature: Optional
Type: Number field
Values: any

Description: The length of the short axis of the leaf, in millimetres: the smallest measurement made for this taxon at this locality.

A5.104. *Wood: largest length of log, mm*

Internal name: Wood Max log length (field)

Nature: Optional
Type: Number field
Values: any

Description: The length of the preserved tree trunk, in millimetres. The largest measurement made for fossil tree trunks at this locality.

A5.105. *Wood: smallest length of log, mm*

Internal name: Wood Min log length (field)

Nature: Optional
Type: Number field
Values: any

Description: The length of the preserved tree trunk, in millimetres. The smallest measurement made for fossil tree trunks at this locality.

A5.106. *n=? wood*

Internal name: n=? for wood (field), Defaulted n for wood (abacus)

Nature: Optional (Defaulted field)
Type: Number field
Values: any integer

Description: Number of preserved tree trucks (logs) from which the log measurements were taken. Default is 1.

A5.107. *Wood: largest diameter of log, mm*

Internal name: Wood Max log diameter (field)

Nature: Optional
Type: Number field
Values: any

Description: The diameter of the preserved tree trunk, in millimetres. The largest measurement made for fossil tree trunks at this locality.

A5.108. *Wood: smallest diameter of log, mm*

Internal name: Wood Min log diameter (field)

Nature: Optional
Type: Number field
Values: any

Description: The diameter of the preserved tree trunk, in millimetres. The smallest measurement made for fossil tree trunks at this locality.

A5.109. *Comments*

Internal name: Comments

Nature: Optional
Type: Text field
Values: any

Description: Comments pertinent to entries on this form.

A5.110. *REF#1*

Internal name: Ref1 (Field)

Nature: Optional
Type: Number field
Values: any

Description: The reference number of the reference used in providing the taxonomic data. If the taxonomic data was the default the reference need not be stated since it will be assumed to be that used in the standard taxonomy.

HELP: E.g. if the reference used is Graham, 1987 (REF#1252) enter "1252" in this field.

A5.111. *Reference Abbrev.1*

Internal name: **Find Ref Name for Ref1** (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only (calculated field)

Description: The reference abbreviation for the Reference number specified in the **Ref1** field.

HELP: Don't worry about this field, the computer fills in this field automatically based upon the ***REF#*** entered.

A5.112. *Pages1*

Internal name: **Pages#Ref1** (Field)

Nature: Optional
Type: Text field
Values: any

Description: The pages from which the data is derived.

Space for five seperate references is provided. The format is the same in each case. Each is distinguished with a different number or letter. Thus, the second reference number field (labeled **REF#**) has the field name **REF#2**, the third **REF#3**, and so on.

A6. ENTER TAXA BY CLIMATE STATION

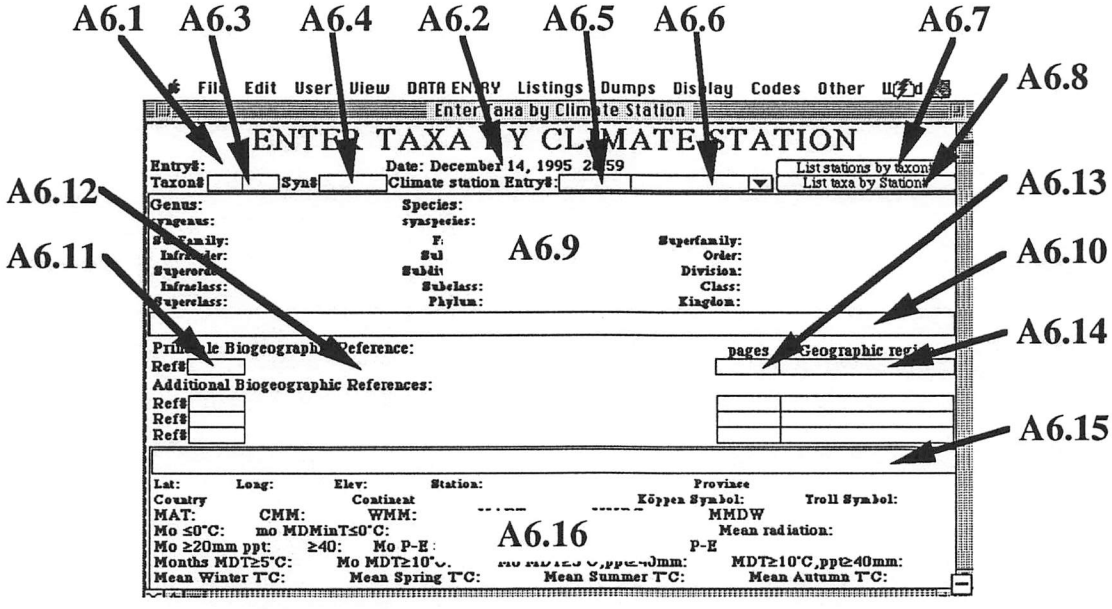
Relation: ***MAIN TAXA BY CLIMATE STATION***

Unique record identifier: ***The combination of STATION# and TAXON#.***

Menu Location: ♦***DATA ENTRY***♦

Accessibilty: ***PROGRAMMER and DATA ENTRY***

This entry form links the taxon to the climate stations in which it occurs using the ***Station#*** from **ENTER CLIMATE STATIONS** and ***Taxon#*** from **ENTER MAIN TAXONOMY**. Once these entries are made the link is established.



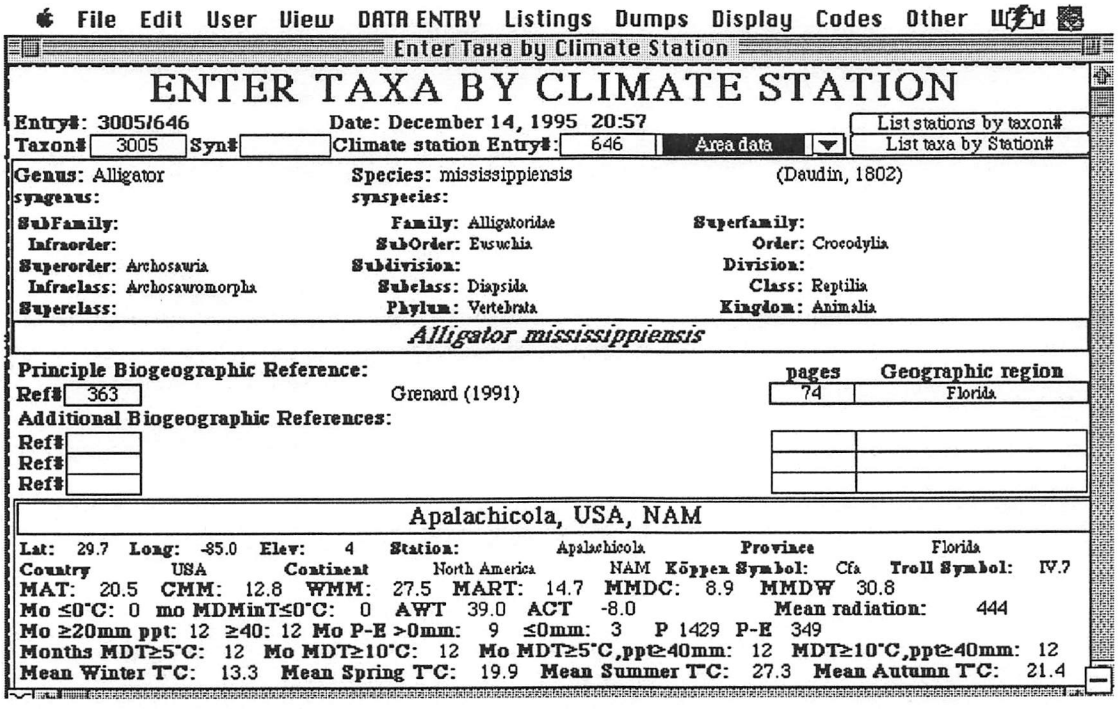


FIGURE A4.10. Screen pictures of the principal entry form in the 'Main Taxa by Climate Station' relation.

A6.1. *Entry#*

Internal name: Entry# (TbyCS)

Nature: Default
Type: Text field
Values: default only

Description: The unique number that represents each record in this relation

HELP: The computer automatically defines this field by concatenating the Station number and taxon number, separating hem with a slash.

A6.2. *Date entered*

Internal name: Date (Field), Form Time (Abacus)

Nature: MANDATORY
Type: Date field
Values: Default on record being initiated

Description: The date on which the record was first defined. The database automatically defiens this field when any value when the record is first entered into the collection (i.e. when the <RETURN> key is pressed

A6.3. *Taxon#*

Internal name: Taxon# (Field)

Nature: MANDATORY[33]
Type: Number field
Values: The taxon number from the **ENTER MAIN TAXA** for the taxon represented.

Description: The unique number that represents the taxon which is to be entered.

HELP: On entry the computer will automatically write the name of the genus and species in the non-selectable fields next to the headings **Genus** and **species**. The computer will also lookup and write out the Family, Order and Class names appropriate to the taxon. This provides a means of checking that the correct taxon number, appropriate to the taxon you wish to link to the locality, has been entered.

---

33. This is a validated field. It must be defined. If this criterion is not met, the computer will make an audible error sound and prevent tabbing to subsequent fields.

A6.4. *Synonymy#*

Internal name: Syn# (Field), Find Syn# for taxon# (Abacus)

Nature: optional (default)
Type: Number field
Values: The synonymy number fassociated with the taxon# entered in field A6.3

Description: The unique number that represents the taxon which is to be entered. If the database discovers that the taxon for the taxon# entered in field A6.3 is synonymized to aother taxon, this synonymy is registered here.

A6.5. *Station#*

Internal name: Station Entry# (Field)

Nature: MANDATORY[34]
Type: Number field
Values: The Station entry number from the ***MAIN CLIMATE STATIONS*** relation for the climate station at which the taxon occurs.

Description: The unique number that represents the climate station at which the designated taxon occurs.

A6.6. *Type of data* (unlabeled field)

Internal name: Type of data (Field)

Nature: optional (recommended)
Type: Text field (static popup menu)
Values: menu choices strongly recommended:
Area data
Point data
Point and area data

Description: The nature of the faunal or floral data used. Most distribution maps show ranges as areas of occupation. Such areas generally overestimate the actual range, because in general they are derived by linking known records of the taxon. Point data is based on actual observation records. These are more reliable, but because because not all individuals in a species or group can be observed simultaneoulsy point data generally underestimates ranges. By qualifying the nature of the record differences between interpretations based on point data and area data can be assessed.

---

34. This is a validated field. It must be defined. If this criterion is not met, the computer will make an audible error sound and prevent tabbing to subsequent fields.

A6.7. *List stations by taxon* Button

Internal name: n/a

Nature: n/a
Type: Sequence button
Values: n/a

Description: This button accesses a listing of all stations at which the taxon entered in field A6.3 occurs.

A6.8. *List taxa by station* Button

Internal name: n/a

Nature: n/a
Type: Sequence button
Values: n/a

Description: This button accesses a listing of all taxa that occur at the climate station entered in field A6.5.

A6.9. This area includes a series of fields that access the taxonomic data appropriate to the taxon# entered in field A6.3.This information is self explanatory and is not described any furter here. For further information see section A2.

A6.10. *Taxon Name*

Internal name: Taxon_name (Field), Taxon_name_(with_syn)

Nature: default
Type: Text abacus
Values: default only

Description: This gives the name of the taxon for the taxon# enetered in field A6.3.

A6.11. *Ref#*

Internal name: REF#1_Source_for_biogeographic_data (Field)

Nature: Optional
Type: Number field

Values: any

Description: The reference number of the reference used in providing the biogeogeographical data.

HELP: E.g. if the reference used is Graham, 1987 (REF#1252) enter "1252" in this field.

A6.12. *Reference Abbrev.1*

Internal name: Find Ref abbrv for REF#1 (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only (calculated field)

Description: The reference abbreviation for the Reference number specified in the **Ref1** field.

HELP: Don't worry about this field, the computer fills in this field automatically based upon the *REF#* entered.

A6.13. *Pages1*

Internal name: Pages1 for REF#1 (Field)

Nature: Optional
Type: Text field
Values: any

Description: The pages from which the data is derived.

A6.14. *Area covered by reference*

Internal name: REF#1 Area (Field)

Nature: Optional
Type: Text field
Values: any

Description: The area for which the reference gives biogeographic information..

Space for four seperate references is provided. The format is the same in each case. Each is distinguished with a different number or letter. Thus, the second reference number field (labeled **REF#**) has the field name REF#2, the third REF#3, and so on.

A6.15. *Climate Station Name*

Internal name: Station name and country (Field),
Station/Province/Country (Abacus)

Nature: default
Type: Text abacus
Values: default only

Description: This gives the name of the climate station for the station# enetered in field A6.5.

A6.16. This area includes a series of fields that access the climate data appropriate to the station# entered in field A6.5.This information is self-explanatory and is not described any further here. For further information see section A4.

B. SECONDARY DATA ENTRY

Information entered into these relations is used as lookup data for the six primary data entry forms. There should be no need for users to access these forms.

By isolating this information into separate relations subsequent changes to say the timescale can be affected without going to each individual record in the Primary entry relations. This makes updating easier and therefore more likely to be enacted.

B1. ENTER STANDARD TAXONOMY

Relation: ***STANDARD TAXONOMY***

Unique record identifier: ***GENUS NAME***

Menu Location: ♦***DATA ENTRY***♦

Accessibilty: ***PROGRAMMER and DATA ENTRY***

Taxonomy is a problem. This is particular true in the 1990's as more and more cladistic analyses are produced with the consequence that changes to the already transient Vertebrate taxonomy are inevitable. In a database with such a broad scope discrepancies with individual workers personal preferences are understandable. Because of these problems no claim is made that the taxonomies used throughout the database are the definitive ones. At present the database uses the taxonomy given in Carroll (Carroll, 1988) as the standard, supplemented where Carroll is found lacking (for instance for birds, where most genera are missing) by the family assignments of Romer (Romer, 1971). This choice was based on the ready availability of this taxonomy for non-paleontologists and its relatively recent publication date. Discussions with a number of vertebrate paleontologists. has suggested that this choice, although not without its problems, is presently an acceptable compromise and the least likely to cause offense. The standard taxonomy forms the basis of all taxonomic affiliations for each taxon above the genus level. This maintains a level of consistency for all sorts and queries concerning taxonomy irrespective of the position on the taxonomic hierarchy.

It is intended to replace this taxonomy with more recent analyses as they become available for instance the work of Sereno on Dinosaurs.

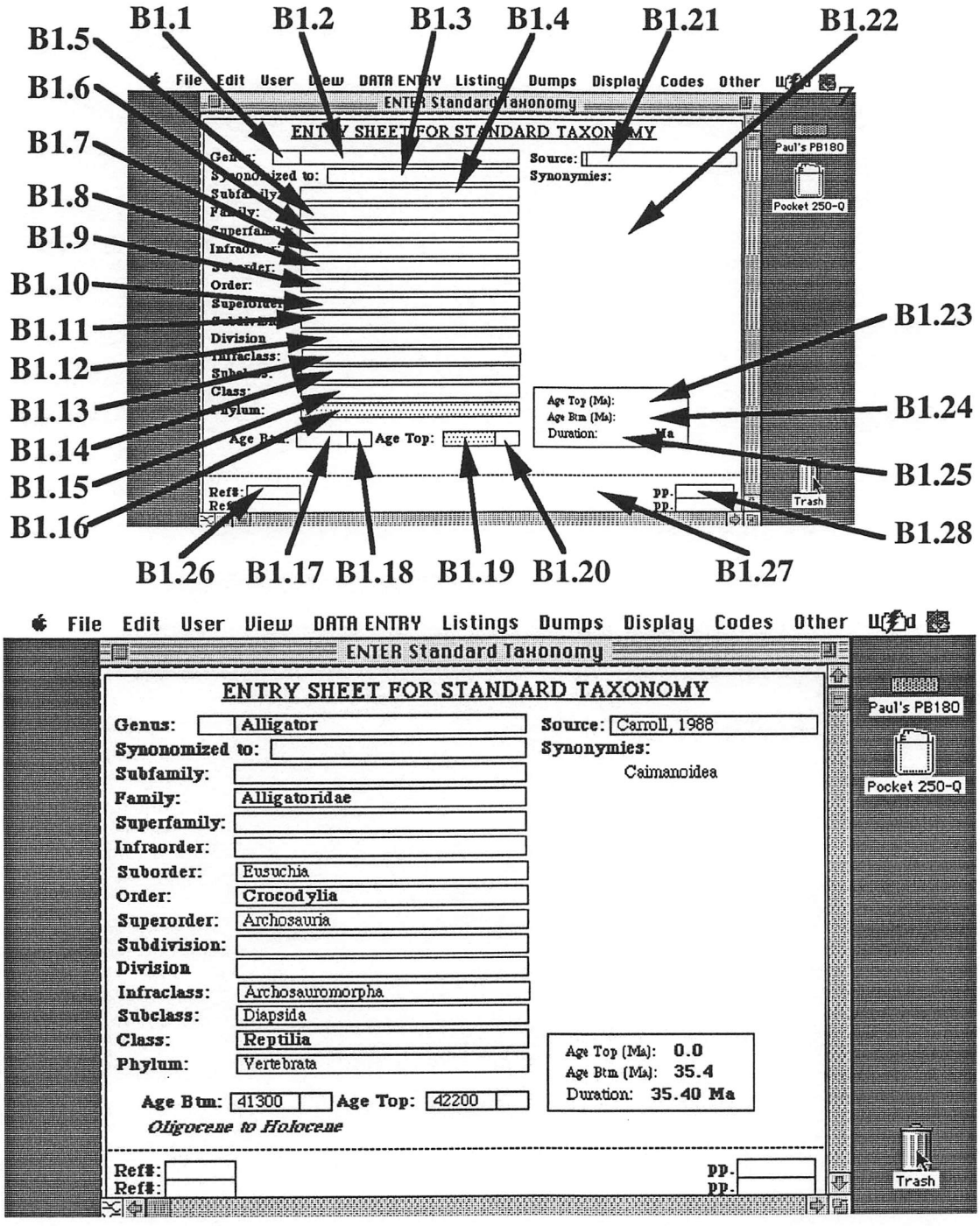


FIGURE A4.11 Screen picture of principal entry form in the "Standard Taxonomy" relation.

B1.1. *Genus name qualifier* (Unnamed field)

Internal name: ?, cf, etc (Field)

Nature: Optional
Type: Text field
Values: any

Description: Qualifier for genus name.

HELP: e.g. ? in "?Homo"

B1.2. *Genus name*

Internal name: Genus_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Genus name.

B1.3. *Synonymized to*

Internal name: Synonymized_to (Field)

Nature: Optional
Type: Text field
Values: any

Description: Genus name to which the entry in the ***Genus Name*** field is synonymized.

B1.4. *Subfamily*

Internal name: Subfamily_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Subfamily name appropriate to the genus entered in the ***Genus Name*** field.

B1.5. *Family*

Internal name: Family_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Family name appropriate to the genus entered in the ***Genus Name*** field.

B1.6. *Superfamily*

Internal name: Superfamily_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Superfamily name appropriate to the genus entered in the ***Genus Name*** field.

B1.7. *Infraorder*

Internal name: Infraorder_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Infraorder name appropriate to the genus entered in the ***Genus Name*** field.

B1.8. *Suborder*

Internal name: Suborder_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Suborder name appropriate to the genus entered in the ***Genus Name*** field.

B1.9. *Order*

Internal name: Order_C (Field)

Nature: Optional

Type: Text field
Values: any

Description: Order name appropriate to the genus entered in the ***Genus Name*** field.

B1.10. *Superorder*

Internal name: Superorder_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Superorder name appropriate to the genus entered in the ***Genus Name*** field.

B1.11. *Subdivision*

Internal name: Subdivision_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Subdivision name appropriate to the genus entered in the ***Genus Name*** field.

B1.12. *Division*

Internal name: Division_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Division name appropriate to the genus entered in the ***Genus Name*** field.

B1.13. *Infraclass*

Internal name: Infraclass_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Infraclass name appropriate to the genus entered in the ***Genus Name*** field.

B1.14. *Subclass*

Internal name: Subclass_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Subclass name appropriate to the genus entered in the ***Genus Name*** field.

B1.15. *Class*

Internal name: Class_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Class name appropriate to the genus entered in the ***Genus Name*** field.

B1.16. *Phylum*

Internal name: Phylum_C (Field)

Nature: Optional
Type: Text field
Values: any

Description: Phylum name appropriate to the genus entered in the ***Genus Name*** field.

B1.17. *Age Btm*

Internal name: Strat_Age_Btm (Field)

Nature: Optional
Type: Number field
Values: any integer (see Section D6 & D7)

Description: Age bottom code (see Section D6 & D7) for appropriate bottom stratigraphic age.

HELP: This is the five digit number as used on the ENTER LOCALITY DATA entry form. On entry the computer will lookup the appropriate stratigraphic name and write this in the space

below this field (abacus: Age Names). This age dating is based on the age range for the relevant genus given in Carroll, 1988 or Romer, 1971.

B1.18. *Age Btm qualifier*

Internal name: ? age btm (Field)

Nature: Optional
Type: Text field
Values: ? or undefined

Description: Qualifies age assignment where necessary.

B1.19. *Age Top*

Internal name: Strat age Top (Field)

Nature: Optional
Type: Number field
Values: any integer (see Section D6 & D7)

Description: Age top code (see Section D6 & D7) for appropriate top stratigraphic age.

HELP: This is the five digit number as used on the ENTER LOCALITY DATA entry form. On entry the computer will lookup the appropriate stratigraphic name and write this in the space below this field (abacus: Age names). This age dating is based on the age range for the relevant genus given in Carroll, 1988 or Romer, 1971.

B1.20. *Age Top qualifier*

Internal name: ? age upper (Field)

Nature: Optional
Type: Text field
Values: ? or undefined

Description: Qualifies age assignment where necessary.

B1.21 *Source*

Internal name: Source (field)

Nature: Optional
Type: Text field

Values: any

Description: Source for standard taxonomy entered in this record

B1.22. *Synonymies*

Internal name: Subform Find Synon.(List)

Nature: Defaulted subform (lookup)
Type: Subform
Values: Not selectable.

Description: Lists synonymies associated with the name entered in the ***Genus Name*** field for this record. The computer will automatically fill this subform.

B1.23. *Age Top (Ma)*

Internal name: Lookup Top Harland Age (Abacus)

Nature: Defaulted field
Type: Number abacus
Values: any real numbers default only

Description: Gives the chronostratigraphic age in millions of years represented by the upper limit of the top stratigraphic age entered in the ***Age Top*** field.

B1.24. *Age Btm (Ma)*

Internal name: Lookup Btm Harland Age (Abacus)

Nature: Defaulted field
Type: Number abacus
Values: any real number default only

Description: Gives the chronostratigraphic age in millions of years represented by the bottom limit of the bottom stratigraphic age entered in the ***Age Btm*** field.

B1.25. *Duration*

Internal name: Duration (Abacus)

Nature: Defaulted field
Type: Number abacus
Values: any real numbers default only

Description: Gives the duration in millions of years represented by the taxon based on the values in the ***Age Top (Ma)*** and ***Age Btm (Ma)*** fields. Values are in millions of years (Ma).

B1.26. *REF#1*

Internal name: Ref#1 (Field)

Nature: Optional
Type: Number field
Values: any

Description: The reference number of the reference used in providing the taxonomic data. If the taxonomic data was the default the reference need not be stated since it will be assumed to be that used in the standard taxonomy.

HELP: E.g. if the reference used is Graham, 1987 (REF#1252) enter "1252" in this field.

B1.27. *Reference Abbrev.1*

Internal name: Lookup Ref Abbrev for Ref#1 (Abacus)

Nature: Defaulted field
Type: Text abacus
Values: default only (calculated field)

Description: The reference abbreviation for the Reference number specified in the **Ref1** field.

HELP: Don't worry about this field, the computer fills in this field automatically based upon the ***REF#*** entered.

B1.28. *Pages1*

Internal name: Pages for Ref1 (Field)

Nature: Optional
Type: Text field
Values: any

Description: The pages from which the data is derived.

Space for two seperate references is provided. The format is the same in each case. Each is distinguished with a different number or letter. Thus, the second reference number field (labeled **REF#**) has the field name **REF#2**.

B1.26. *Comments* (Not shown on the figure)

Internal name: Comments

Nature: Optional
Type: Text field
Values: Any

Description: For comments related to entries on the **STANDARD TAXONOMY ENTRY FORM.**

B2. ENTER JOURNAL DATA

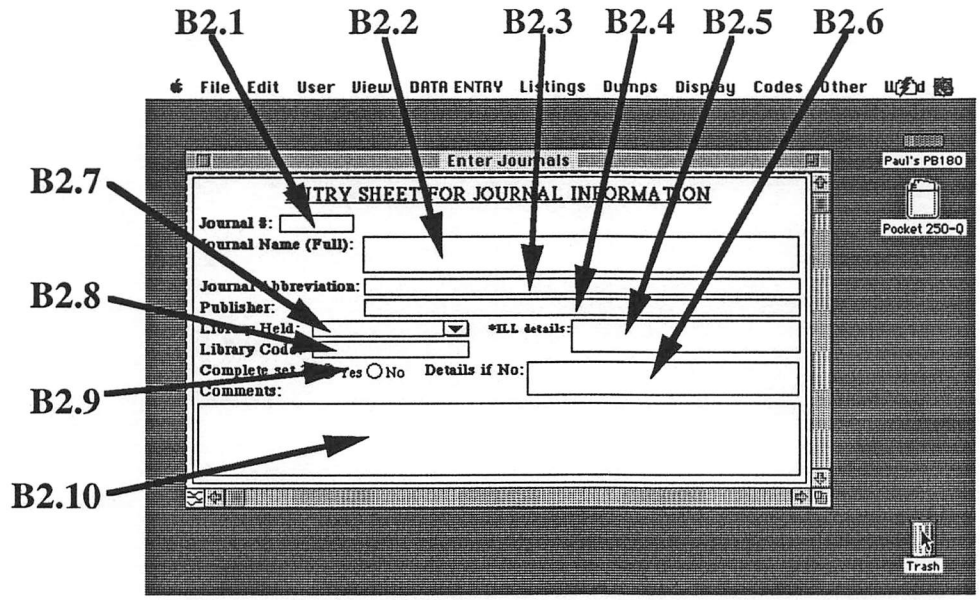
Relation: ***JOURNAL LOOKUP***

Unique record identifier: ***JOURNAL#***

Menu Location: ♦***DATA ENTRY***♦

Accessibilty: **PROGRAMMER** ***and DATA ENTRY***

Allows entry of journal information to be made together with library information that will facilitate later literature searches. A direct link with the **ENTER REFERENCES** entry form is made through a dynamic pop-up menu using the field ***Journal Name.***



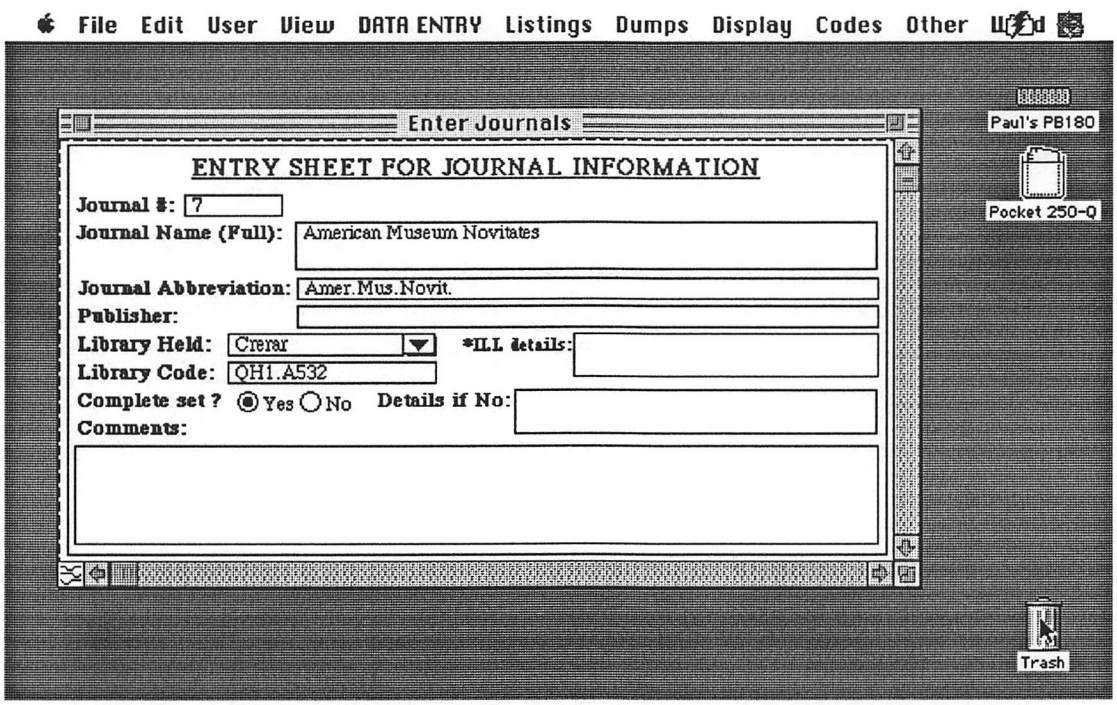


FIGURE A4.12. Screen picture of principle entry form in the "Journal Lookup" relation

B2.1. *Journal #*

Internal name: Journal # (field), ing#2(abacus)

Nature: Optional (Defaulted)
Type: Number field
Values: Any integer

Description: Unique number generated by the computer.

B2.2. *Journal Name (Full)*

Internal name: Journal Name (Field)

Nature: Optional
Type: Text field
Values: Any

Description: Full Journal name.

B2.3. *Journal Abbreviation*

Internal name: Journal Abbreviation (Field)

Nature: Optional
Type: Text field
Values: Any

Description: Principle abbreviation. There may be different abbreviations for the same journal. If this is the case such information may be stored in the ***Comments*** field.

B2.4. *Publisher*

Internal name: Publisher (Field)

Nature: Optional
Type: Text field
Values: Any

Description: The full name of the publisher of the journal.

B2.5. *Library Held*

Internal name: Library (Field)

Nature: Optional
Type: Text field (pop-up menu)
Values: Any

Description: The library in which the journal was located. The pop-up menu is designed for work done at the University of Chicago.

B2.6. *Library Code*

Internal name: Library Code (Field)

Nature: Optional
Type: Text field
Values: Any

Description: The shelf library code for the volume. e.g. QE12.P345.

B2.7. **ILL details*

Internal name: ILL details (Field)

Nature: Optional
Type: Text field
Values: Any

Description: For information concerning an Inter-library loan (ILL).

B2.8. *Complete set ?*

Internal name: Complete set? (Field)

Nature: Optional
Type: Flag field
Values: Yes (Y) or No (N)

Description: Does the library entered in field ***Library Held*** have the full set of the journal entered in the field ***Journal Name (Full)***.

B2.9. *Details if No*

Internal name: Details if No (Field)

Nature: Optional
Type: Text field
Values: Any

Description: Details if the definition of the ***Complete set ?*** field is No (N). Information on what the library has and where.

B2.10. *Comments*

Internal name: Comments (Field)

Nature: Optional
Type: Text field
Values: Any

Description: Comments related to entries on this form

B3. ENTER TIMESCALE

Relation: ***TIMESCALE***

Unique record identifier: ***TIMESCALE CODE***

Menu Location: ***♦DATA ENTRY♦***

Accessibilty: ***RESTRICTED: PROGRAMMER only.***

For entry or editing of chronostratigraphic assignments. There should be no need to access this entry form, since all of the codes have already been entered. The 5-digit codes generated as records on this entry form are those that are accessed within other entry forms by the field names ***Age Btm*** and ***Age Top*** . This is the timescale used in all of the Paleogeographic Atlas Project databases. Additions have been made where necessary: 'Subrecent' (code 42400)and 'Present day' (code 42300). The coding scheme was originally designed by Michael Hulver, University of Chicago, in order to make searches more efficient. However, as databases have become more powerful reflecting advances in both computer hardware and software, the necessity for using numeric codes to facilitate speed is less acute. Consequently the futuure versions of the database will see a return to using text, such that users will need only enter things such as "Early Eocene" or "middle Oligocene," the database will do the rest.

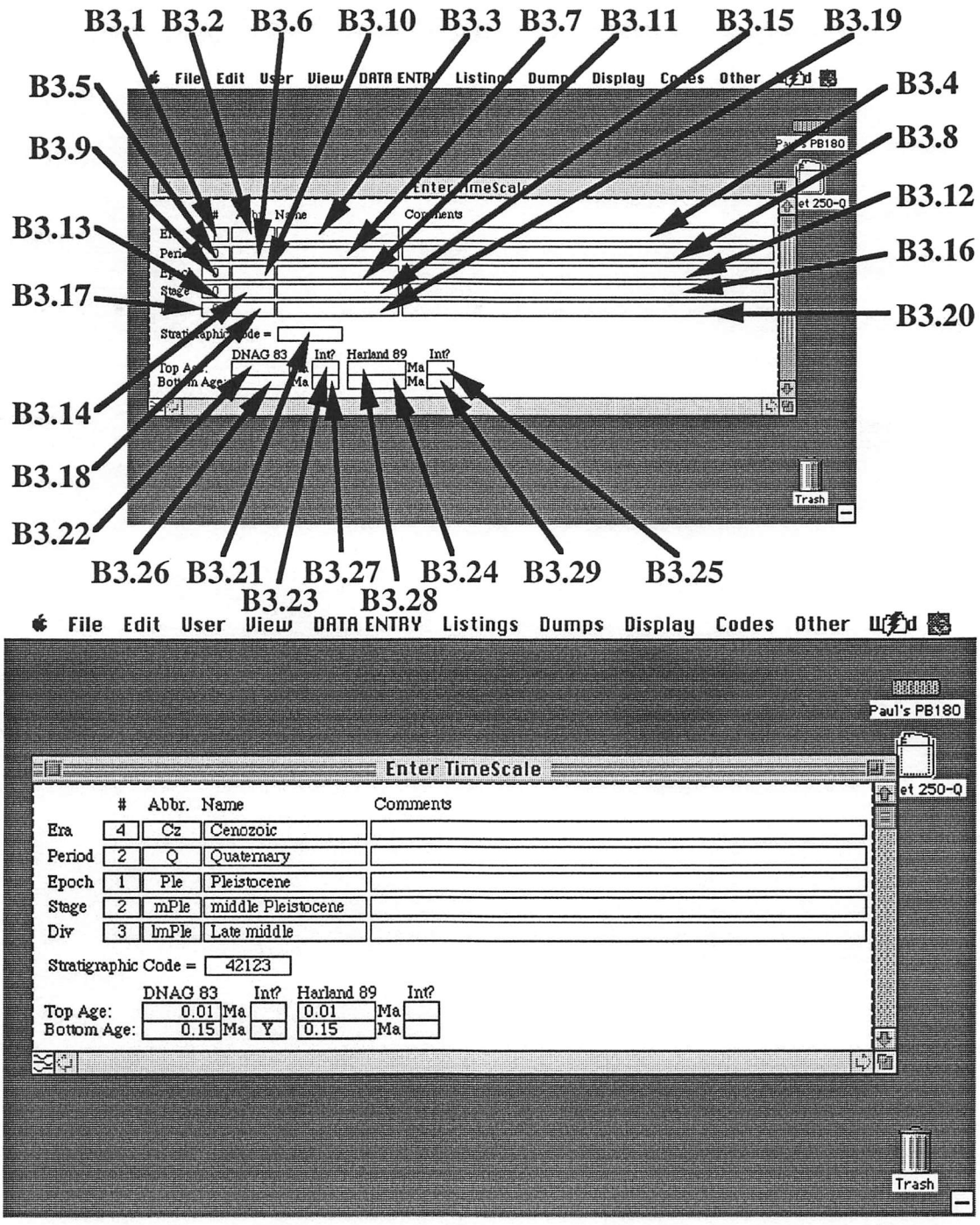


FIGURE A4.13. Screen picture of principal entry form in the "Timescale" relation.

B3.1. *Era #*

Internal name: Era (Field)

Nature: MANDATORY
Type: Number field
Values: Any integer: $0 \leq x \geq 9$ (see Section D6)

Description: The code representing the stratigraphic era (See Section D6). This becomes the first digit of the 5-digit stratigraphic code.

B3.2. *Era abbreviation*

Internal name: Era_Abbr (Field)

Nature: MANDATORY
Type: Text field
Values: Any (see Section D6)

Description: The abbreviated form of the Era name.

B3.3. *Era Name*

Internal name: Era_Name (Field)

Nature: MANDATORY
Type: Text field
Values: Any

Description: Full Era name.

B3.4. *Era comments*

Internal name: Era_Comments (Field)

Nature: Optional
Type: Text field
Values: Any

Description: Comments associated with the Era related entries.

B3.5. *Period #*

Internal name: Period (Field)

Nature: MANDATORY
Type: Number field
Values: Any integer: $0 \leq x \geq 9$ (see Section D6)

Description: The code representing the stratigraphic Period (See Section C6). This becomes the second digit of the 5-digit stratigraphic code.

B3.6. *Period abbreviation*

Internal name: Period Abbr (Field)

Nature: MANDATORY
Type: Text field
Values: Any (see Section D6)

Description: The abbreviated form of the Period name, e.g. 'P' for Permian

B3.7. *Period Name*

Internal name: Period Name (Field)

Nature: MANDATORY
Type: Text field
Values: Any

Description: Full Period name.

B3.8. *Period comments*

Internal name: Period Comments (Field)

Nature: Optional
Type: Text field
Values: Any

Description: Comments associated with the Period related entries.

B3.9. *Epoch #*

Internal name: Epoch (Field)

Nature: MANDATORY

Type: Number field
Values: Any integer: $0 \leq x \geq 9$ (see Section D6)

Description: The code representing the stratigraphic Epoch (See Section D6). This becomes the third digit of the 5-digit stratigraphic code.

B3.10. *Epoch abbreviation*

Internal name: Epoch_Abbr (Field)

Nature: MANDATORY
Type: Text field
Values: Any (see Section D6)

Description: The abbreviated form of the Epoch name.

B3.11. *Epoch Name*

Internal name: Epoch_Name (Field)

Nature: MANDATORY
Type: Text field
Values: Any

Description: Full Epoch name.

B3.12. *Epoch comments*

Internal name: Epoch_Comments (Field)

Nature: Optional
Type: Text field
Values: Any

Description: Comments associated with the Epoch related entries.

B3.13. *Stage #*

Internal name: Stage (Field)

Nature: MANDATORY
Type: Number field
Values: Any integer: $0 \leq x \geq 9$ (see Section D6)

Description: The code representing the stratigraphic Stage (See Section D6). This becomes the forth digit of the 5-digit stratigraphic code.

B3.14. *Stage abbreviation*

Internal name: Stage_Abbr (Field)

Nature: MANDATORY
Type: Text field
Values: Any (see Section D6)

Description: The abbreviated form of the Stage name.

B3.15. *Stage Name*

Internal name: Stage_Name (Field)

Nature: MANDATORY
Type: Text field
Values: Any

Description: Full Stage name.

B3.16. *Stage comments*

Internal name: Stage_comments (Field)

Nature: Optional
Type: Text field
Values: Any

Description: Comments associated with the Stage related entries.

B3.17. *Div #*

Internal name: StageDiv (Field)

Nature: MANDATORY
Type: Number field
Values: Any integer: $0 \leq x \geq 9$ (see Section D6)

Description: The code representing the stratigraphic Stage division (early, middle, late etc.,) (See Section D6). This becomes the fifth digit of the 5-digit stratigraphic code.

B3.18. *Div abbreviation*

Internal name: StageDiv_Abbr (Field)

Nature: MANDATORY
Type: Text field
Values: Any (see Section D6)

Description: The abbreviated form of the Stage division name.

B3.19. *Div Name*

Internal name: StageDiv_Name (Field)

Nature: MANDATORY
Type: Text field
Values: Any

Description: Full Stage Division name.

B3.20. *Div comments*

Internal name: StageDiv_Comments (Field)

Nature: Optional
Type: Text field
Values: Any

Description: Comments associated with the Stage Division related entries.

B3.21. *Stratigraphic Code* =

Internal name: Time_Code (field), Make_Time_Code (abacus)

Nature: Defaulted field
Type: Number field and abacus
Values: 5-digit integer (see Section D6)

Description: The code representing the stratigraphic interval (See Section D6). This is the code used throughout the database. This field is automatically filled on the basis of entries in the following fields: ***Era #, Period #, Epoch #, Stage #, Div #.***

B3.22. *Top Age DNAG*

Internal name: DNAG (83) Top Age (field), Lookup DNAG Top (abacus)

Nature: Optional
Type: Number field
Values: Any real number

Description: The upper age in millions of years of the interval represented by the record. This age is that given for the interval on the DNAG timescale.

B3.23. *Top Age DNAG interpolated ?*

Internal name: DNAG Top Interpolated? (Field)

Nature: Optional
Type: Text field
Values: ?

Description: If defined states that the age entered in the field ***Top Age DNAG*** is interpolated.

B3.24. *Top Age Harland 89*

Internal name: Harland Top Age (field), Lookup Harland Top (abacus)

Nature: MANDATORY
Type: Number field
Values: Any real number

Description: The upper age boundary in millions of years of the interval entered in this record. This age is that given for the interval in the Harland 1989 timescale.

B3.25. *Top Age Harland 89 interpolated ?*

Internal name: Har Top Interpolated? (Field)

Nature: Optional
Type: Text field
Values: ?

Description: If defined states that the age entered in the field ***Top Age Harland 89*** is interpolated.

B3.26. *Bottom Age DNAG*

Internal name: DNAG(83) Bottom Age (field), Lookup DNAG Bot (abacus)

Nature: Optional
Type: Number field
Values: Any real number

Description: The lower age in millions of years of the interval represented by this record. This age is that given for the interval on the DNAG timescale.

B3.27. *Bottom Age DNAG interpolated ?*

Internal name: DNAG Bot Interpolated? (Field)

Nature: Optional
Type: Text field
Values: ?

Description: If defined states that the age entered in the field ***Bottom Age DNAG*** is interpolated.

B3.28. *Bottom Age Harland 89*

Internal name: Harland Bottom Age (field), Lookup Harland Bot (abacus)

Nature: MANDATORY
Type: Number field
Values: Any integer

Description: The lower age boundary, in millions of years, of the interval entered in this record. This age is that given for the interval in the Harland 1989 timescale.

B3.29. *Bottom Age Harland 89 interpolated ?*

Internal name: Har Bot Interpolated? (Field)

Nature: Optional
Type: Text field
Values: ?

Description: If defined states that the age entered in the field ***Bottom Age Harland 89*** is interpolated.

B4. ENTER LOCAL TIME UNITS

Relation: ***TIMESCALE II***

Unique record identifier: ***TIME UNIT NAME***

Menu Location: ♦***DATA ENTRY***♦

Accessibilty: ***RESTRICTED: PROGRAMMER only.***

This entry form is for stratigraphic names not included in Harland, 1989. This includes local stage names, mammal stages, and zones. This provides a greater resolution of dating to localities than is provided by using the established epochs and European Marine Stage Names. For each record the Time Unit is tied to chronostratigraphic ages where they are provided. Harland equivalents are generally obtained using magnetostratigraphy where available and appropriate. Each Time Unit is also related to a European Marine Stage equivalent in order to provide some continuity with the general timescale used throughout the database.

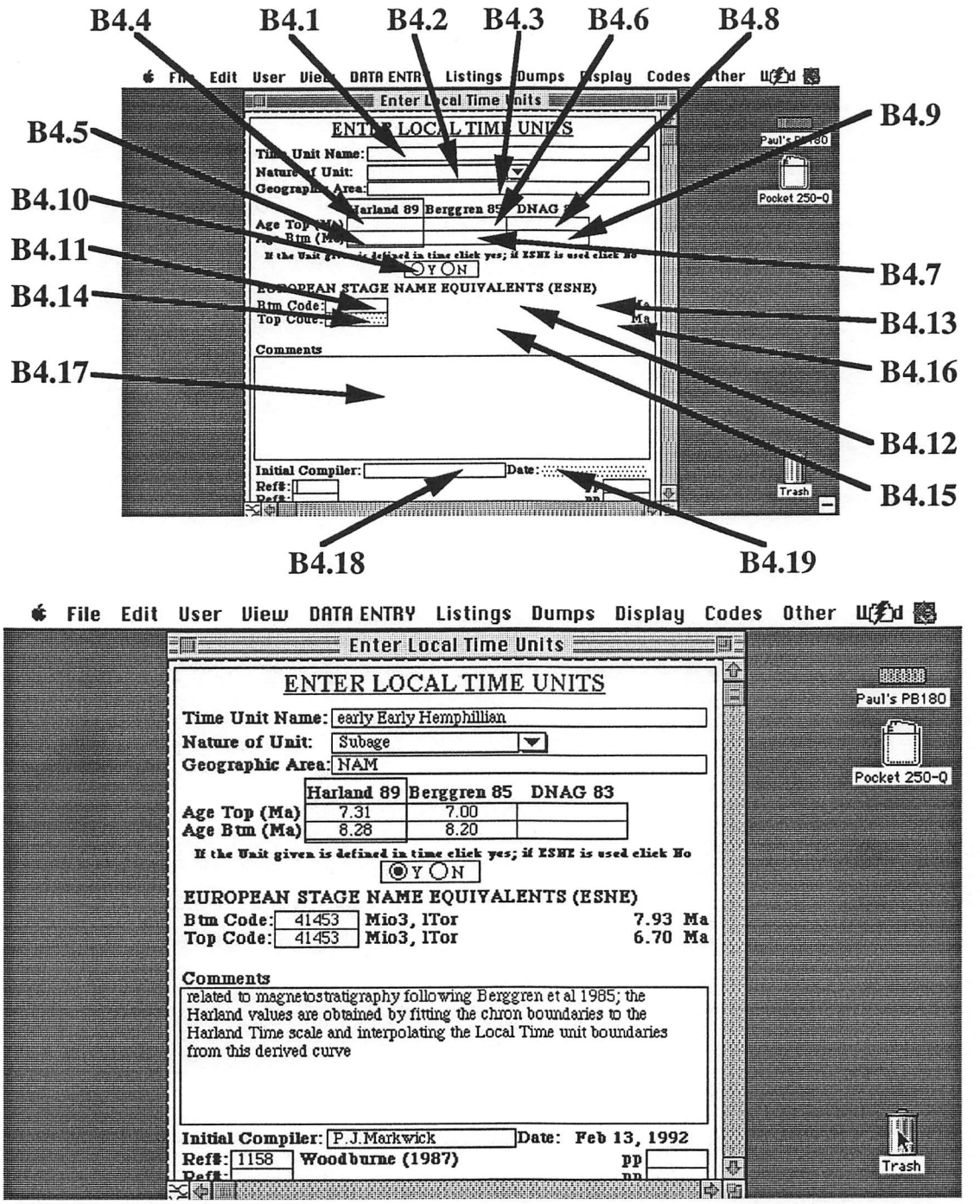


FIGURE A4.14. Screen picture of principal entry form in the "Timescale II" relation.

B4.1. *Time Unit Name*

Internal name: Time Unit Name (Field)

Nature: MANDATORY
Type: Text field
Values: any

Description: The full name of the local time unit.

HELP: E.g. "Aragonian" or "Wasatchian". Note that if the unit can be divided into early, middle, late then these qualifiers need to be used, thus "early Aragonian" or "middle early Aragonian" need to be included here if they are definable.

B4.2. *Nature of Unit*

Internal name: Nature of Time Unit (Field)

Nature: Optional
Type: Text field (Pop-up menu)
Values: any. Options in menu:

Fauna
Local Fauna
Mammal Age
Other
Stage
Subage
Substage
Subzone
Zone

Description: Nature of the time unit.

HELP: Whether the time unit is a mammalian stage name or a zonal name, palynological name etc. early, middle and late need to be included where defined see section B4.1. e.g. enter "Mammal stage" for Wasatchian, or simply "stage" for Aragonian.

B4.3. *Geographic area*

Internal name: Area Applicable (Field)

Nature: Optional
Type: Text field
Values: any

Description: The geographic area to which the Time Unit applies.

Help: e.g. "North America" if the Time Slice is a North American Mammal Age such as the Tiffanian

B4.4. *Harland 89 Age Top (Ma)*

Internal name: Age_Top_Harland_89 (Field)

Nature: Optional
Type: Number field
Values: any real number (2 decimal places shown)

Description: The top age in millions of years of the time unit as given in Harland (Harland, et al., 1990) or as interpolated to the Harland timescale.

Help: e.g. "11.60" as implied for the top of the Aragonian in Steininger et al (Steininger, et al., 1990) taking into account the differences in timescales. In cases where the authors have used another timescale other than Harland on which to base there unit ages it is possible to obtain the approximate Harland ages by correlation with the magnetostratigraphy.

B4.5. *Harland 89 Age Btm (Ma)*

Internal name: Age_Btm_Harland_89 (Field)

Nature: Optional
Type: Number field
Values: any real number (2 decimal places shown)

Description: The bottom age in millions of years of the time unit as given in Harland (Harland, et al., 1990) or as interpolated to the Harland timescale.

Help: e.g. "18.67" as implied for the bottom of the Aragonian in Steininger et al (Steininger, et al., 1990) taking into account the differences in timescales. In cases where the authors have used another timescale other than Harland on which to base there unit ages it is possible to obtain the approximate Harland ages by correlation with the magnetostratigraphy.

B4.6. *Berggren 85 Age Top (Ma)*

Internal name: Age_Top_Berggren'85 (Field)

Nature: Optional
Type: Number field
Values: any real number (2 decimal places shown)

Description: The top age in millions of years of the time unit as given in Berggren (Berggren, et al., 1985) or as interpolated to the Berggren timescale.

Help: e.g. "11.60" as implied for the top of the Aragonian in Steininger et al (Steininger, et al., 1990) taking into account the differences in timescales.

B4.7. *Berggren 85 Age Btm (Ma)*

Internal name: Age_Btm_Berggren'85 (Field)

Nature: Optional
Type: Number field
Values: any real number (2 decimal places shown)

Description: The bottom age in millions of years of the time unit as given in Berggren (Berggren, et al., 1985) or as interpolated to the Berggren timescale.

Help: e.g. "18.00" as implied for the bottom of the Aragonian in Steininger et al (Steininger, et al., 1990) taking into account the differences in timescales.

B4.8. *DNAG 83 Age Top (Ma)*

Internal name: Age_Top_DNAG_83 (Field)

Nature: Optional
Type: Number field
Values: any real number (2 decimal places shown)

Description: The top age in millions of years of the time unit as given in DNAG timescale (Palmer, 1983) or as interpolated to the DNAG timescale.

B4.9. *DNAG 83 Age Btm (Ma)*

Internal name: Age_Btm_DNAG_83 (Field)

Nature: Optional
Type: Number field
Values: any real number (2 decimal places shown)

Description: The bottom age in millions of years of the time unit as given in DNAG timescale (Palmer, 1983) or as interpolated to the DNAG timescale.

B4.10. *If the Unit given is defined in time.....*

Internal name: Unit defined in Time? (Field)

Nature: Optional
Type: Flag field
Values: Yes (Y) or No (N)

Description: Whether the time unit is defined in time or is represented by the ages of stratigraphically equivalent European Marine Ages.

Help: If the unit is defined in time, such as in the case of the Aragonian, then this field is Yes (Y). This means that the ages entered in the ***Harland 89 Age Top (Ma)*** and ***Harland 89 Age Btm (Ma)*** fields will be used wherever the time unit Aragonian is used. If the entry had been No (N) then wherever the name had appeared the database would have used the top and bottom ages for the European Stages entered in the following field below as equivalent to the unit in question.

B4.11. *Btm Code*

Internal name: Btm Age Code (Field)

Nature: Optional
Type: Number field
Values: any integer (see Section C6 for codes)

Description: The bottom code for the stratigraphic interval from the relation ***TIMESCALE*** which represents the equivalent of the bottom of the unit given in the ***Time Unit Name*** field above.

Help: e.g. The Aragonian approximately ranges from the late Burdigalian through to the Serravallian. Therefore in this example the code for Serravallian should be entered in this field "41440".

B4.12. *Bottom Code Abbreviation* (unnamed field)

Internal name: Lookup Abbrev Btm (Abacus)

Nature: Optional (defaulted field)
Type: Text abacus
Values: default only

Description: The abbreviation for the stratigraphic interval represent by the code entered in B4.11.

B4.13. *Bottom Age (Ma)* (unnamed field)

Internal name: Lookup_btm_age_Harland (Abacus)

Nature: Optional (defaulted field)
Type: Number abacus
Values: default only

Description: The bottom age in millions of years for the stratigraphic interval represented by the code entered in B4.11.

B4.14. *Top Code*

Internal name: Top_Age_Code (Field)

Nature: Optional
Type: Number field
Values: any integer (see Section C6 for codes)

Description: The top code for the stratigraphic interval from the relation ***TIMESCALE*** which represents the equivalent of the top of the unit given in the ***Time Unit Name*** field above.

Help: e.g. The Aragonian approximately ranges from the late Burdigalian through to the Serravallian. Therefore in this example the code for late Burdigalian should be entered in this field "41423".

B4.15. *Top Code Abbreviation* (unnamed field)

Internal name: Lookup_Abbrev_Top (Abacus)

Nature: Optional (defaulted field)
Type: Text abacus
Values: default only

Description: The abbreviation for the stratigraphic interval represent by the code entered in B4.14.

B4.16. *Top Age (Ma)* (unnamed field)

Internal name: Lookup_Top_age_Harland (Abacus)

Nature: Optional (defaulted field)
Type: Number abacus
Values: default only

Description: The top age in millions of years for the stratigraphic interval represented by the code entered in B4.14.

B4.17. *Comments*

Internal name: Comments (Field)

Nature: Optional
Type: Text field
Values: any

Description: Comments pertinent to entries on this form

B4.18. *Initial Compiler*

Internal name: Initial_Compiler (Field)

Nature: Optional (keep value)
Type: Text field
Values: any

Description: Compiler whom initiated this record

B4.19. *Date*

Internal name: Date_Compiled (field), Todays_Date (abacus)

Nature: Optional
Type: Date field
Values: any

Description: Date on which this record was initialized.

B5. ENTER AREAS

Relation: ***GEOGRAPHY***

Unique record identifier: ***AREA CODE***

Menu Location: ♦***DATA ENTRY***♦

Accessibilty: ***RESTRICTED: PROGRAMMER only.***

For entry of Area Codes as used in all Paleogeographic Atlas Project databases. There should be no need to access this entry form. See appendices D1 and D2 for codes and area names. In addition to the codes, the area in square kilometers and population size for the area is included (this is intended to help collection bias questions in the fossil dataset).

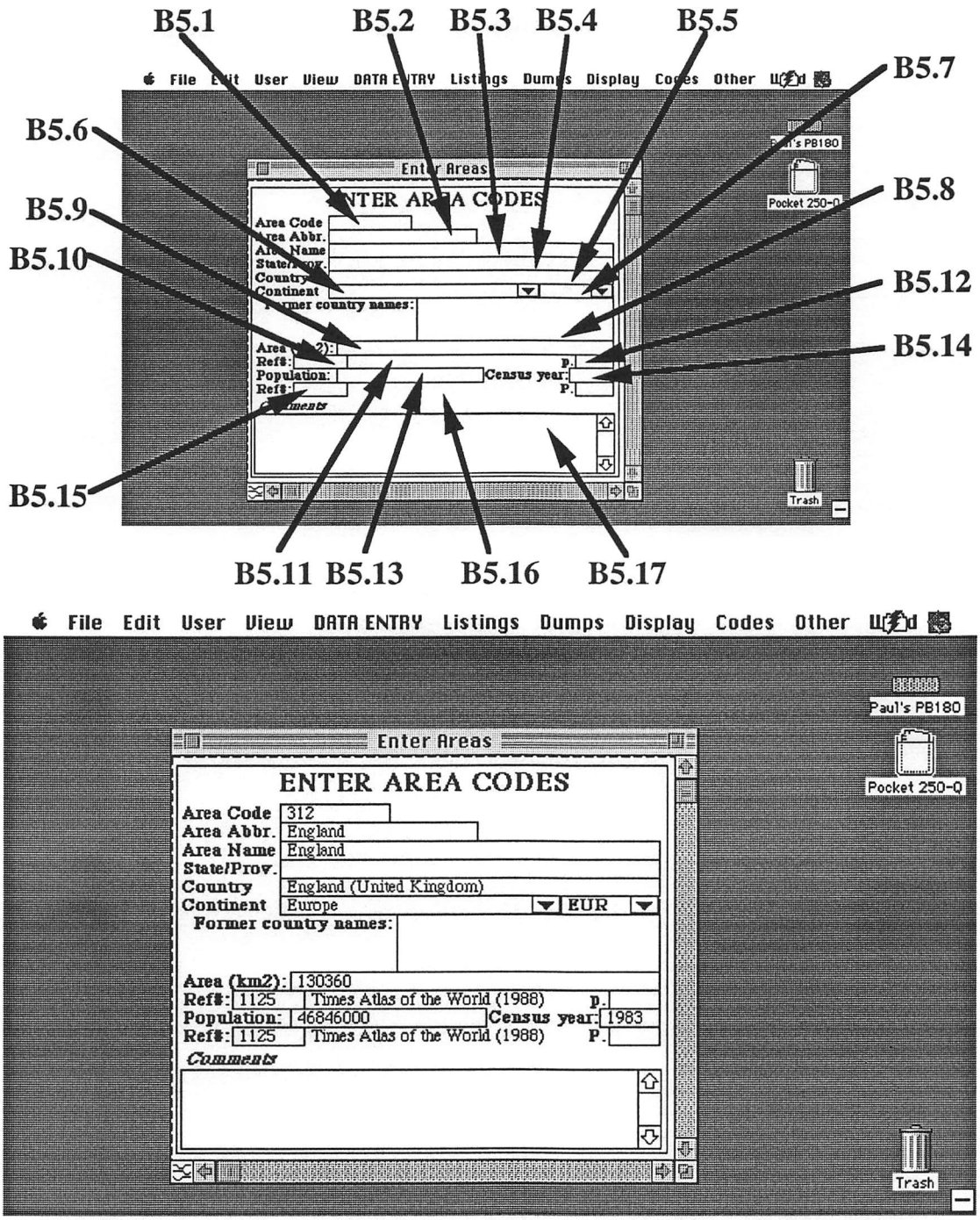


FIGURE A4.15. Screen picture of principal entry form in the "Geography" relation.

B5.1. *Area code*

Internal name: Area Code (Field)

Nature: MANDATORY
Type: Text field
Values: any

Description: See section D1 or D2 for choices

B5.2. *Area abbreviation*

Internal name: Area Abbr(Field)

Nature: Recommended
Type: Text field
Values: any

Description: The abbreviated name of the area (see section D1 or D2)

B5.3. *Area Name*

Internal name: Area Name (Field)

Nature: MANDATORY
Type: Text field
Values: any

Description: The full name of the area.

B5.4. *State Province*

Internal name: State/Province (Field)

Nature: Optional
Type: Text field
Values: any

Description: The state or province name appropriate to the area name.

B5.5. *Country*

Internal name: Country (Field)

Nature: Optional
Type: Text field
Values: any

Description: The country name appropriate to the area name.

B5.6. *Continent name*

Internal name: Continent (Field)

Nature: Optional
Type: Text field
Values: any

Description: The continennt name appropriate to the area name.

B5.7. *Continent abbreviation*

Internal name: Continent_abbreviation (Field)

Nature: Optional
Type: Text field
Values: any

Description: The abbreviation for the continent name. The following list gives the full names for each abbreviation:

AFR - Africa
ANT - Antarctica
AUS - Australia
ASIA - Australasia
EUR - Europe
IND - Indian subcontinent
NAM - North America
PAC - Pacifica
SAM - South America

B5.8. *Former country name*

Internal name: Former_country_name (Field)

Nature: Optional
Type: Text field
Values: any

Description: In the twentieth century especially numerous countries have changed their names and boundaries. This field allows a record of such changes to be kept. This is particularly useful for when the older lliterature is being examined..

B5.9. *Area, km²*

Internal name: Area_in_km2 (Field)

Nature: Optional
Type: Number field
Values: any

Description: The spatial area in square kilometers of the area in the record.

B5.10. *Reference for area data*

Internal name: Ref_for_area (Field)

Nature: Optional
Type: Number field
Values: any

Description: The reference number for the reference used.

B5.11. *Reference Abbreviation*

Internal name: Lookup_abbrev_for_area_ref (Abacus)

Nature: Default
Type: Text abacus
Values: default only

Description: The reference abbreviation for the reference code number entered in field B5.10.

B5.12. *Reference page numbers*

Internal name: pages_for_area (Field)

Nature: Optional
Type: Text field
Values: any

Description: The relevant page numbers for this reference.

B5.13. *Population*

Internal name: Population (Field)

Nature: Optional
Type: Number field
Values: any

Description: The human population of the area.

B5.14. *Census year*

Internal name: Year of census (Field)

Nature: Optional
Type: Number field
Values: any

Description: The census year for the population value given.

B5.15. *Reference for population data*

Internal name: Ref for popn (Field)

Nature: Optional
Type: Number field
Values: any

Description: The reference number for the reference used.

B5.16. *Reference Abbreviation*

Internal name: Lookup abbrev for popn ref (Abacus)

Nature: Default
Type: Text abacus
Values: default only

Description: The reference abbreviation for the reference code number entered in field B5.15.

B5.17. *Reference page numbers*

Internal name: pages_for_popn (Field)

Nature: Optional
Type: Text field
Values: any

Description: The relevant page numbers for this reference.

B5.18. *Comments*

Internal name: Comments_(enter_areas) (Field)

Nature: Optional
Type: Text field
Values: any

Description: Comments pertinent to this record.

B6. ENTER PLATE ID'S

Relation: ***PLATE ID's***

Unique record identifier: ***PLATE ID***

Menu Location: ♦***DATA ENTRY***♦

Accessibilty: ***RESTRICTED: PROGRAMMER only.***

For entry of Plate Codes as used in all Paleogeographic Atlas Project databases. There should be no need to access this entry form. See appendices D4 and D5 for codes and plate names. A map of plate boundaries is available.

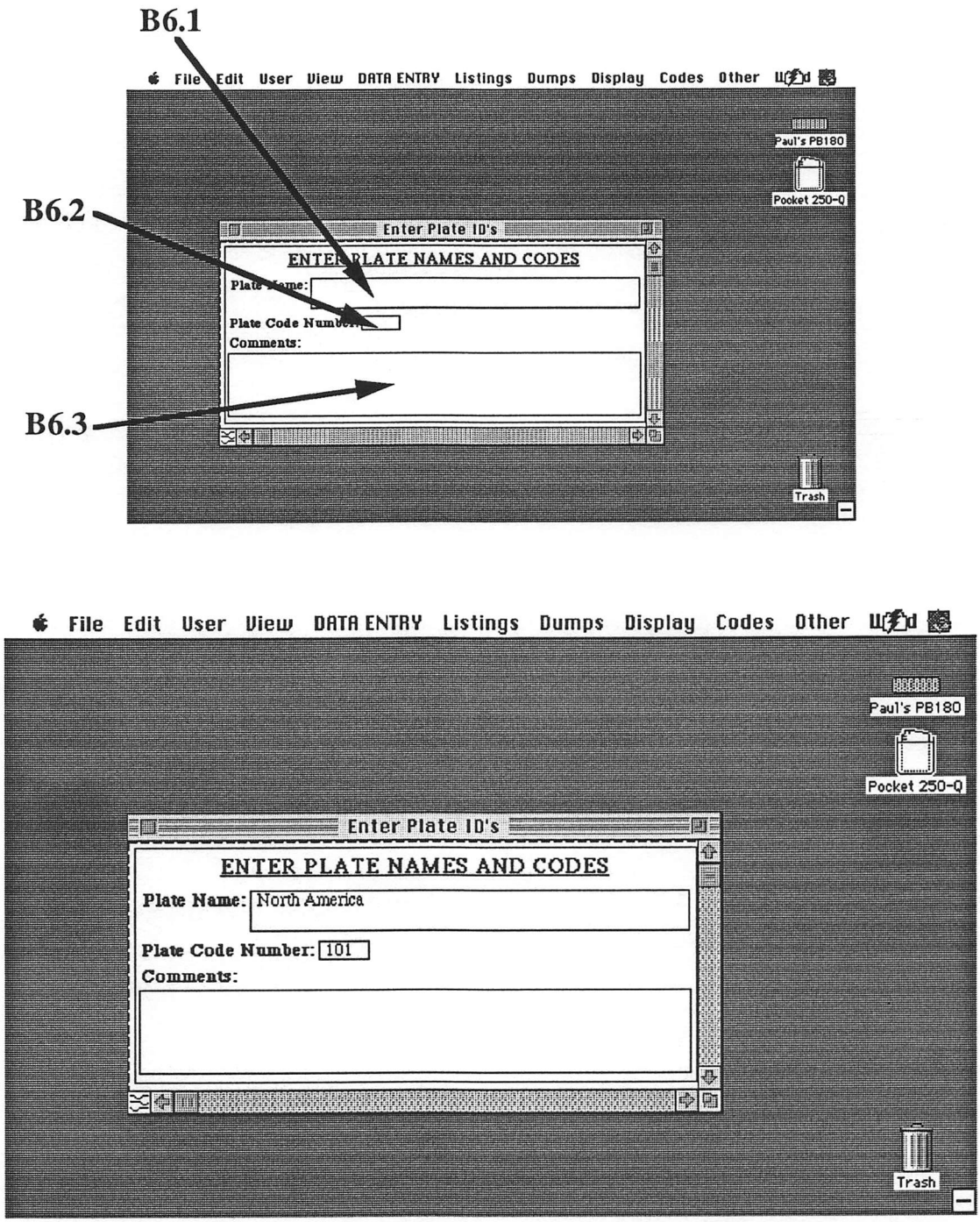


FIGURE A4.16. Screen picture of principal entry form in the "Plate ID's" relation.

B6.1. *Plate Name*

Internal name: Plate_Name (Field)

Nature: Optional
Type: Text field
Values: any

Description: The name of the tectonic plate.

B6.2. *Plate ID*

Internal name: Plate_ID (Field)

Nature: Optional
Type: Number field
Values: any

Description: The three digit code number for the plate as used by the Paleogeographica Atlas Project in their plate rotation programs (see section D4 and D5).

B6.3. *Comments*

Internal name: Comments (Field)

Nature: Optional
Type: Text field
Values: any

Description: Comments pertinent to this record.

B7. ENTER MINOR SYNONYMS

Relation: ***MINOR SYNONYMYS***

Unique record identifier:

Menu Location: ***♦DATA ENTRY♦***

Accessibilty: ***PROGRAMMER and DATA ENTRY.***

For entry of synonymy data not used in the database, but which a record is required. For example synonymies given by a specific reviewer that are different to those used by the database. This entry form is also accessible through the sequence button on the Main Taxonomy Data Entry form. At present this is not in use and so is not included in this version of the manual.

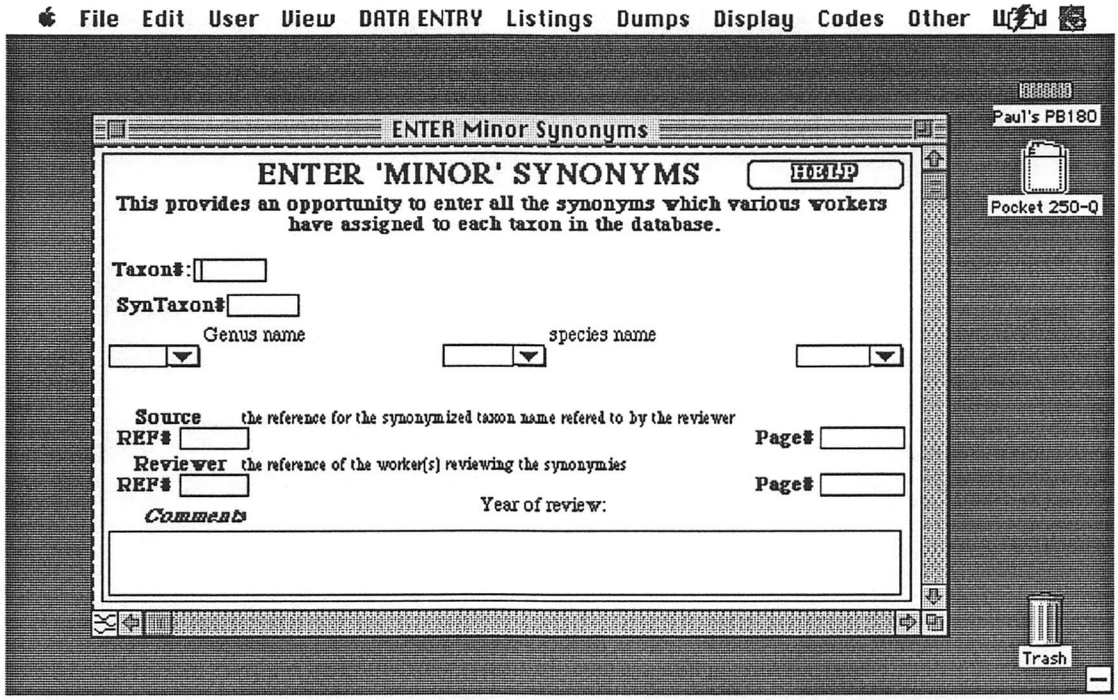


FIGURE A4.17. Screen picture of principal entry form in the "Minor Synonymies" relation.

B8. ENTER RECONSTRUCTIONS

Relation: ***RECONSTRUCTIONS***

Unique record identifier: Loc#

Menu Location: ♦***DATA ENTRY***♦

Accessibilty: ***PROGRAMMER and DATA ENTRY.***

This relation stores all of the reconstructed coorinates for localities in the ***MAIN LOCALITY*** relation. Palaeocoordinates (palaeolatitude and palaeolongitude) are available for the following time intervals (stages/sub-epochs in lower case, EPOCHS in upper case) for localities as applicable:

Aptian	116 Ma
Albian	105 Ma
Cenomanian	92 Ma
Turonian	90 Ma
Coniacian	88 Ma
Santonian	85 Ma
Campanian	78 Ma
Maastrichtian	70 Ma
Early Palaeocene	63 Ma
Late Palaeocene	59 Ma
Early Eocene	55 Ma
Middle Eocene	46 Ma
Late Eocene	38 Ma
Early Oligocene	33 Ma
Late Oligocene	26 Ma
Early Miocene	20 Ma
Middle Miocene	10 Ma
Late Miocene	8 Ma
SENONIAN	70 Ma
PALAEOCENE	59 Ma
EOCENE	46 Ma
OLIGOCENE	26 Ma
MIOCENE	10 Ma
PLIOCENE	3 Ma
PLEISTOCENE	0 Ma

C. EXAMPLES

Helix Express® allows customized listings and forms to be readily constructed using any combination of fields and abaci from within a relation. Listings utilizing data from more than one relation can be made using subforms from one relation placed within the form of another and linked by a common identifier (these identifiers contain the same entry information, but may comprise two fields with different names). Various forms and listings have been constructed through the last four years often for temporary projects that required particular information from records. The present lists available in the following menus are only a small proportion of those possible.

A distinction is made between lists which show data and those used to dump data to external programs. The later do not include form information such as number of localities, or number of taxa represented on the list, nor do they retain header information on being dumped. All dumps produce text files which can then be accessed by other software.

Form information is included on many lists which summarizes information contained in those lists. Sorting such lists using queries will according change this summary information.

The custom menus also include access to the database glossary and various templates giving collection information such as the total number of taxa in the database and so forth.

Double clicking on an entry on a list will access the entry form used to enter that record and show all the data entered for that record..

In the following figures, examples of different forms, lists and subforms are presented in order to give a visual impression of the power of this database in providing the freedom to relate, query and examine the data, once entered, in a multitude of ways.

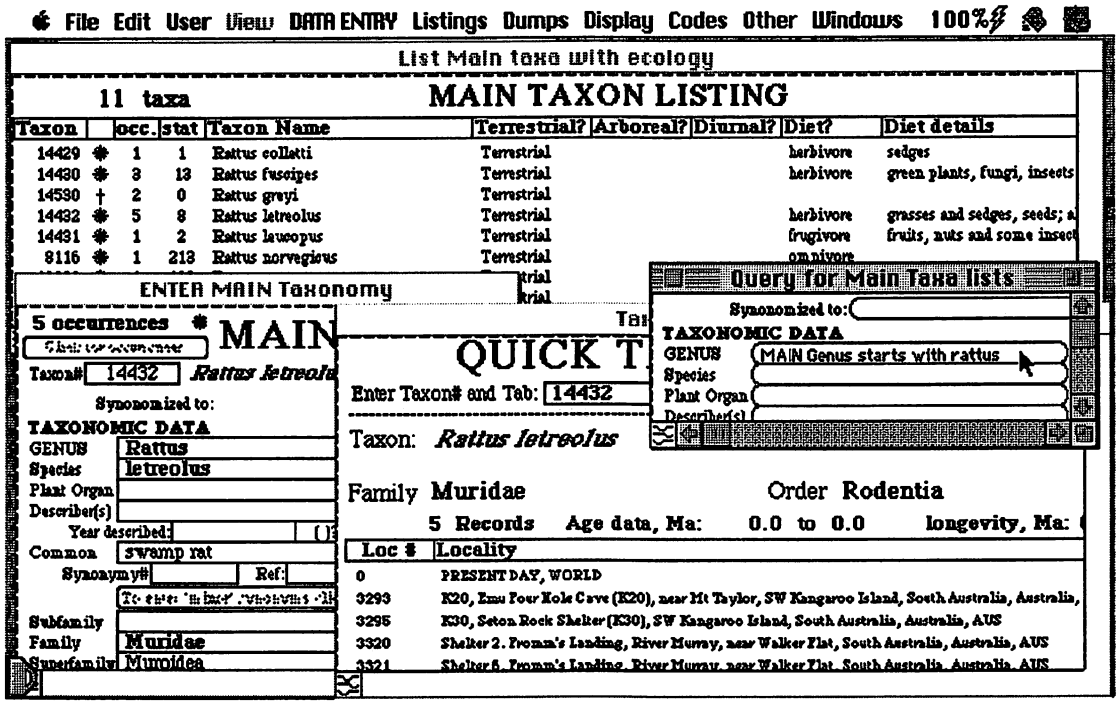


FIGURE A4.18 Screen picture showing range of easily accessible listings.

The Helix Express software allows any listing to be easily constructed, bringing together information from the same relation (top list above, which shows some ecological information for different species of the genus *Rattus*, all stored in the ***MAIN TAXONOMY*** relation), or from different relations (bottom right., in which the occurrences of the species *Rattus letreolus* are derived from the ***MAIN TAXA BY LOCALITY***relation). As elsewhere, double-clicking on a record brings up more information. So, for instance, double clicking on the entry for *Rattus letreolus*in the top list has brought up the original record for this taxon (left). By clicking on the button in the top left hand corner of this record the list of occurrences for this taxon has been obtained (bottom right). If desired the records shown in this last listing could be double-clicked to bring up the original complete occurrence record in the ***MAIN TAXA BY LOCALITY*** relation, with all of its associated specimen and size information. In this way users can rapidly move around the database (throughout the database, double-clicking on a record will usually allow access to more detailed information).

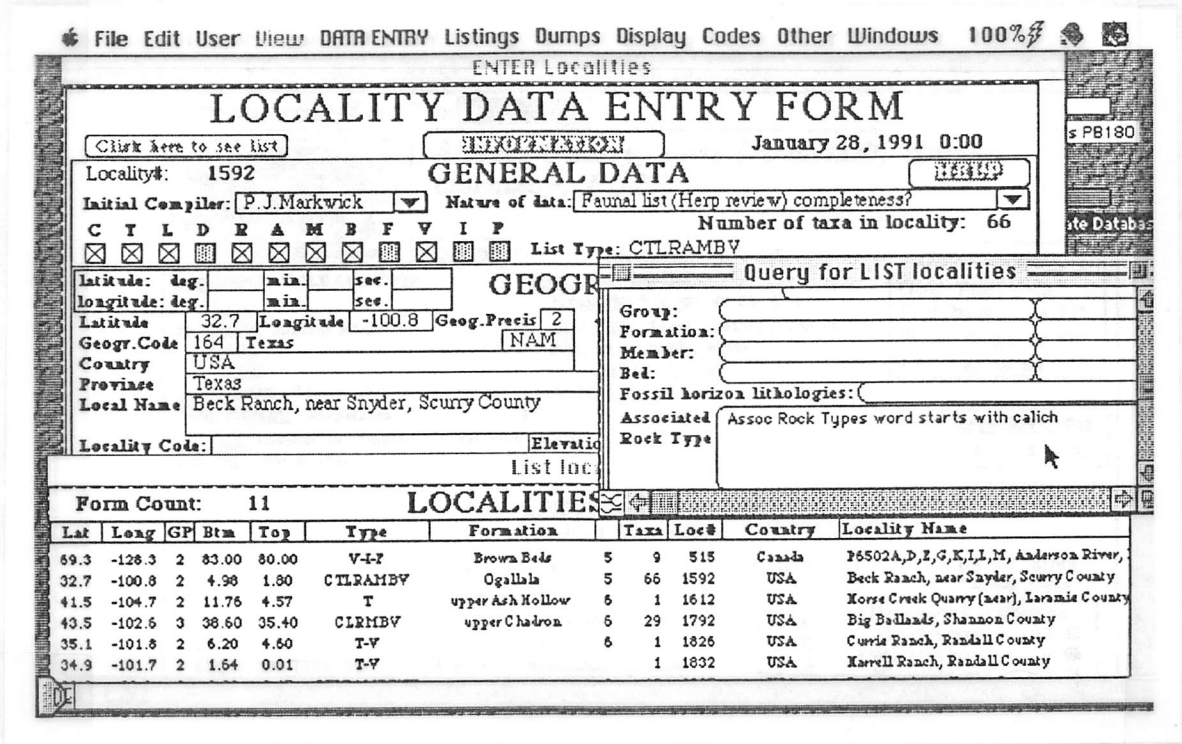


FIGURE A4.19 Screen picture illustrating the power of keyword searches.

Throughout the database queries for listings are made using a version of the main entry form, for the relation in question. This means that searches can be made in which every field in the relation is in some way defined (if so desired). In general, searches are based on only one or two queried fields. Such searches are expedited using keyword fields, for which the database automatically creates indices. For instance, in the example shown above the complete list of fossil localities stored in the database has been searched for the presence of caliches. Almost instantaneously the query found eleven localities with caliches (a low number of finds here reflects, in part, the present incompleteness of the lithological data; in this case the field searched, ***Associated rock type***, is a keyword field). Consequently this database might be used to look for the distribution of a particular sediment type rather than for fossils, or instead to look for sedimentary evidence that might support conclusions based on fossils (e.g., the presence of caliches indicates aridity and corroborates the interpretation based on the mammal assemblage).

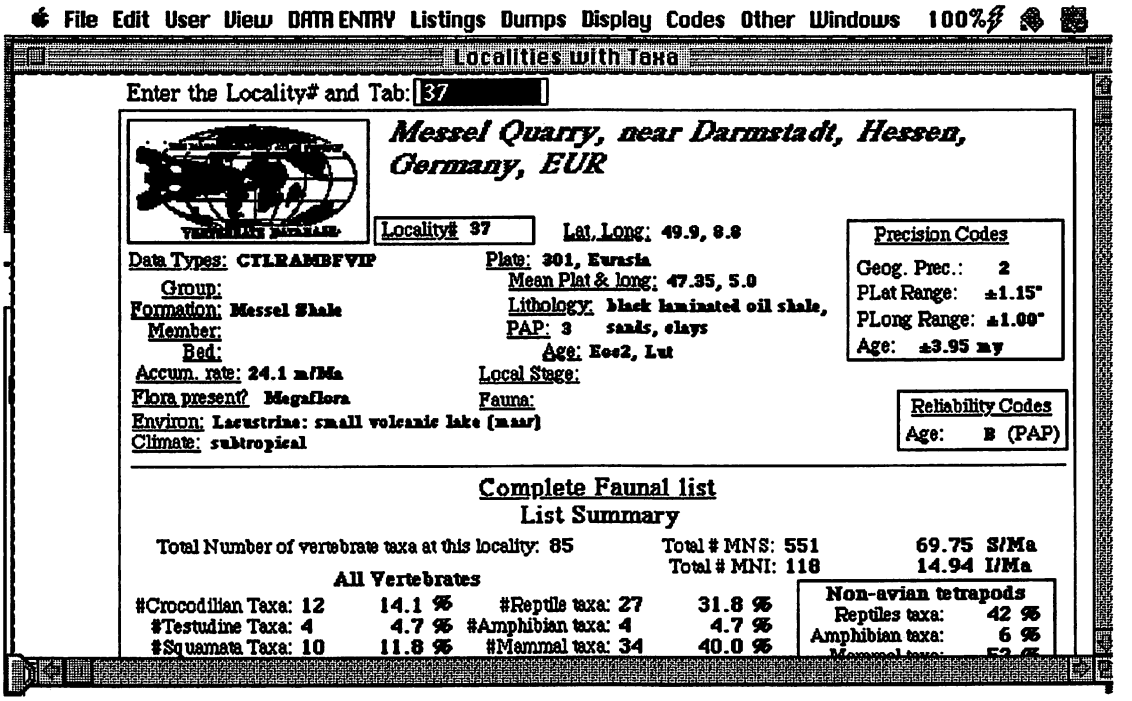


FIGURE A4.20 Screen picture illustrating the a summary listing.

The figure above shows the top half of a listing that gives not only the environmental and lithological data for the locality from the ***MAIN LOCALITY*** relation, but also the complete faunal list for the locality (below field of view). This faunal information is summarized by the database to give the breakdown of the percentage composition of the fauna. Such information is easily obtained using the database. In this case the composition is simply the number of species representing specified taxonomic groups (mammals, reptiles, etc.). Alternatively the summary might be used to examine the size breakdown of the locality's fauna, or the feeding strategy (modern day), or the ratio of entire to non-entire margined leaves. Again, the database allows such questions to be quickly addressed.

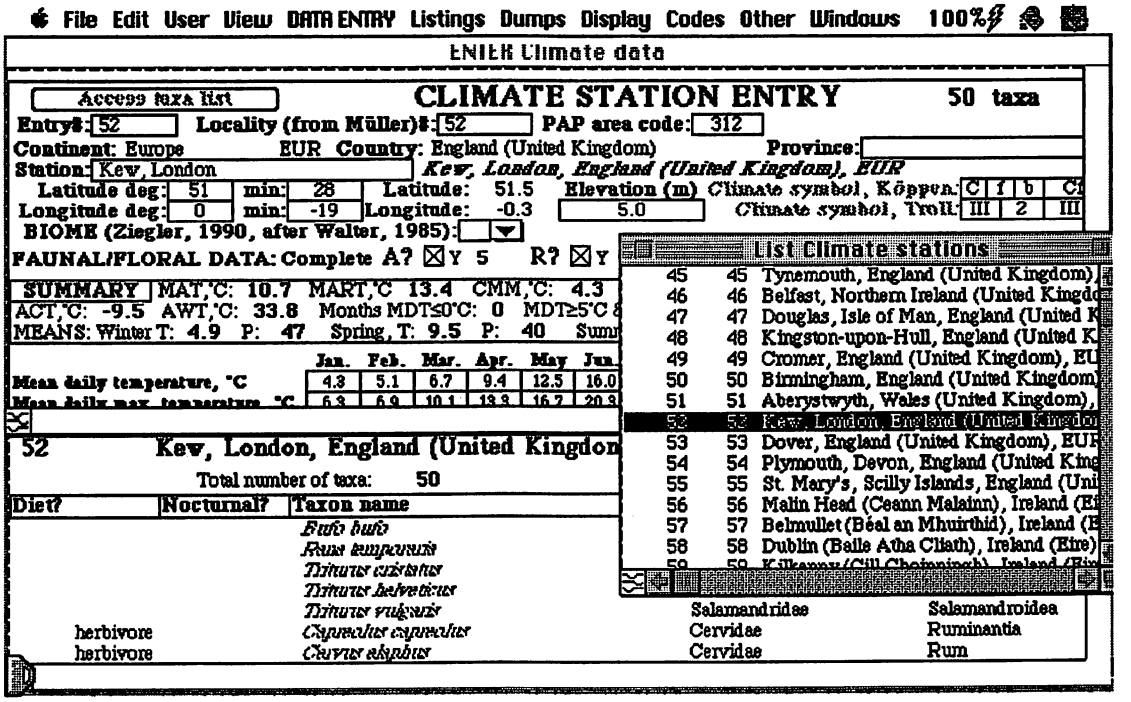


FIGURE A4.21 Screen picture showing climate station related information.

The inclusion of modern day climate data and the association of faunal and floral data with these records, has opened up a whole range of possible questions that may be addressed. As with all parts of the database, searches can be made based on any criterion. Thus a search might be made for all species that live below certain mean winter temperatures, or that only occur when at least five months have precipitation above a certain value. Consequently, although originally designed for looking at modern relationships to apply to the geological record, the modern day dataset also provides a powerful tool for examing the Recent in it's own right. To date this data source has been used to make preliminary investigtions of the role of climate in determing diversity, and also the link between primary productivity (using the NDVI data) and diversity. Although the climate data has global coverage, the associated faunas are presently limited to North America, Europe, Australia, and incomplete data from South America, Arabia and southern Africa. As more areas are incorporated in this dataset, the potential for understanding the role of climate in influencing, or even determining, global biogeography and biodiversity, becomes more realistic.

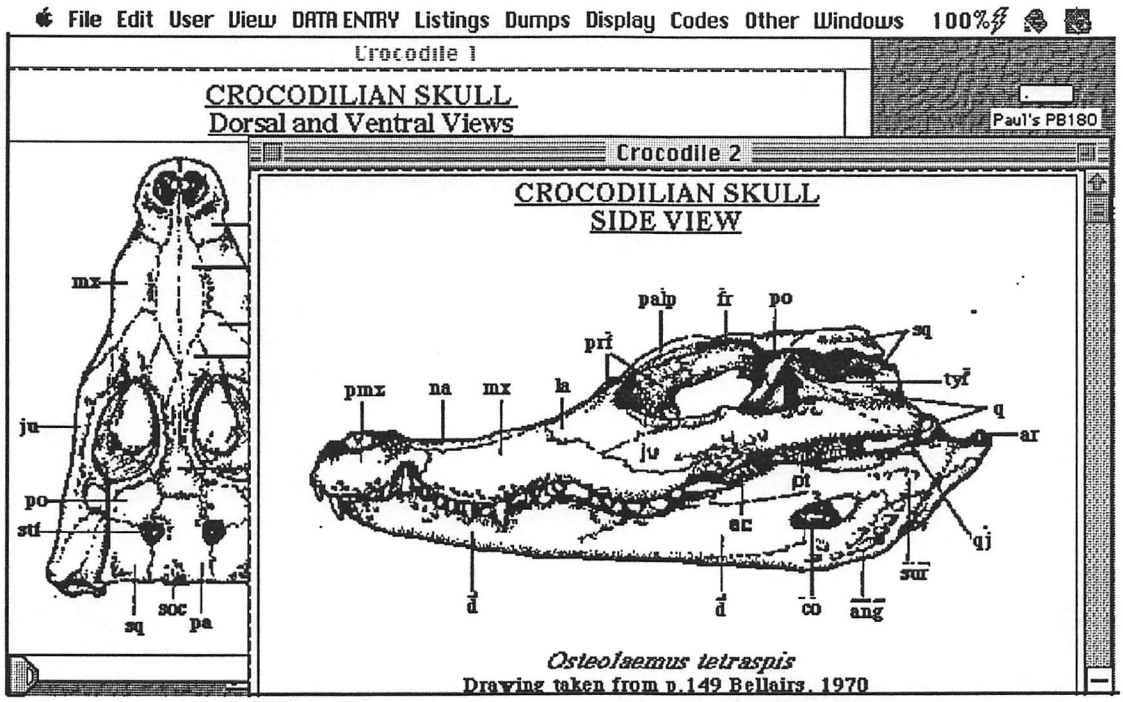


FIGURE A4.22 Screen picture showing the potential for storing images within the database.

At present, the only images stored within the database are for use as a glossary of morphological terms for turtles and crocodilians (the principal emphasis of the author's dissertation). However, the potential uses are diverse: as a teaching tool; identification aid; means of analyzing morphological indicators of environment, such as the folial physiognomic method.

D. CODES USED IN THE DATABASE

These are the codes used throughout the database and in other Paleogeographic Atlas Project databases. These are also found under the **CODES** menu.

D1. Geographic codes (by number)

Code	Area_Abbrev.	Area_Full_Name
000	World	World
100	N.Greenlnd	North Greenland
101	N.GrnlndSh	North Greenland Shelf
102	E.Greenlnd	East Greenland
103	E.GrnlndSh	East Greenland Shelf
104	W.Greenlnd	West Greenland
105	W.GrnlndSh	West Greenland Shelf
10x	Greenland	Greenland
110	Quebec	Quebec
111	Newfndland	Newfoundland
112	Labrador	Labrador
113	PrEdwIsl	Prince Edward Island
114	NovaScotia	Nova Scotia
115	NewBrunsw	New Brunswick
116	G.StLawren	Gulf of St. Lawrence
117	E.CanadaSh	Eastern Canada Shelf Area
11x	E.Canada	Eastern Canada
120	NW.Terr	North West Territories
121	HudsonBay	Hudson Bay
122	Ontario	Ontario
123	Manitoba	Manitoba
124	Saskatch	Saskatchewan
125	Alberta	Alberta
126	BritColum	British Columbia
127	Yukon	Yukon Territory
12x	W.Canada	Western Canada
130	N.Alaska	Northern Alaska
131	S.Alaska	Southern Alaska
132	AlaskaPanh	Alaskan Panhandle
133	AleutIs	Aleutian Islands
134	BeringSh	Bering Shelf
135	BeringBs	Bering Basin
13x	Alaska	Alaska
140	NewEngland	New England
141	NE.USASh	Northeastern USA Shelf Area
142	NewJersey	New Jersey
143	Delaware	Delaware
144	Maryland	Maryland
145	W.Virginia	West Virginia

Code	Area_Abbrev.	Area_Full_Name
146	Pennsylvan	Pennsylvania
147	NewYork	New York
14x	NE.USA	Northeast United States
150	Virginia	Virginia
151	N.Carolina	North Carolina
152	S.Carolina	South Carolina
153	Georgia	Georgia
154	Florida	Florida
155	Alabama	Alabama
156	Tennessee	Tennessee
157	Kentucky	Kentucky
158	SE.USASh	Southeastern USA Shelf Area
15x	SE.USA	Southeastern United States
160	Missouri	Missouri
161	Arkansas	Arkansas
162	Mississipp	Mississippi
163	Louisiana	Louisiana
164	Texas	Texas
165	Oklahoma	Oklahoma
166	Kansas	Kansas
167	SC.USASh	South Central USA Shelf Area
16x	SC.USA	South Central United States
170	Minnesota	Minnesota
171	Wisconsin	Wisconsin
172	Michigan	Michigan
173	Ohio	Ohio
174	Indiana	Indiana
175	Illinois	Illinois
176	Iowa	Iowa
177	Nebraska	Nebraska
178	S.Dakota	South Dakota
179	N.Dakota	North Dakota
17x	NC.USA	North Central United States
180	Montana	Montana
181	Wyoming	Wyoming
182	Colorado	Colorado
183	NewMexico	New Mexico
184	Arizona	Arizona
185	Utah	Utah
18x	RockyMtUSA	Rocky Mountain United States
190	Washington	Washington
191	Idaho	Idaho
192	Oregon	Oregon
193	Nevada	Nevada
194	California	California
195	W.USASh	Western USA Shelf Area
19x	Wn.USA	Western USA
1xx	N.America	North America
200	MexicoS.S.	Mexico sensu stricto
201	GulfMexico	Gulf of Mexico
202	GulfCal	Gulf of California

Code	Area_Abbrev.	Area_Full_Name
203	Baja	Baja California
204	Wn.MexSh	Western Shelf Area of Mexico
20x	Mexico	Mexico
210	Bahamas	Bahamas
211	GrtAntill	Greater Antilles
212	LsrAntill	Lesser Antilles
213	CaribSea	Caribbean Sea
214	Cen.Amer	Central America
215	W.CenAmSh	Western Central America Shelf Area
21x	Caribbean	Caribbean
220	NW.SAmerSh	North Western Shelf Area South America
221	Ecuador	Ecuador
222	Colombia	Colombia
223	Venezuela	Venezuela
224	Guyana	Guyana
225	Surinam	Surinam
226	FrenGuyana	French Guyana
227	N.SAmerSh	Northern Shelf Area South America
22x	N.SAmerica	Northern South America
230	BrazilSh	Brazilian Shelf Area
231	Brazil	Brazil
232	Paraguay	Paraguay
233	Bolivia	Bolivia
234	Peru	Peru
235	PeruShelf	Peruvian Shelf Area
23x	Cen.SAmer	Central South America
240	Argentina	Argentina
241	Uruguay	Uruguay
242	ArgentSh	Argentinian Shelf Area
243	FalklandIs	Falkland Islands
244	FalklndPla	Falkland Islands Plateau
245	N.ScotiaRg	Nova Scotia Ridge
246	S.GeorgIs	South Georgia Island
247	Chile	Chile
248	ChileShelf	Chilean Shelf Area
249	ScotiaArc	Scotia Arc
24x	S.SAmerica	Southern South America
2xx	Mid&SAmer	Middle and South America
300	Svalbard	Svalbard
301	BarentSea	Barents Sea
302	Finland	Finland
303	BalticSea	Baltic Sea
304	Sweden	Sweden
305	Denmark	Denmark
306	Norway	Norway
307	NorwaySh	Norwegian Shelf Area
30x	Scandinav	Scandinavia
310	NorthSea	North Sea
311	Scotland	Scotland
312	England	England
313	EnglChnl	English Channel

Code	Area_Abbrev.	Area_Full_Name
314	IrishSea	Irish Sea
315	Ireland	Ireland
316	WBritIsSh	Western British Isles Shelf Area
317	RockallPla	Rockall Plateau
318	FaeroeSh	Faeroe Shelf
319	Wales	Wales
31x	BritishIs	British Isles
320	Belg/Luxem	Belgium and Luxembourg
321	Netherlnds	Netherlands
322	W.Germany	West Germany
323	Austria	Austria
324	Switzrland	Switzerland
325	Italy	Italy
326	France	France
327	W.EuropeSh	Western Europe Shelf Area
328	Spain	Spain
329	Portugal	Portugal
32x	W.Europe	Western Europe
330	E.Germany	East Germany
331	Poland	Poland
332	Czechoslov	Czechoslovakia
333	Hungary	Hungary
334	Romania	Romania
335	Yugoslavia	Yugoslavia
336	Bulgaria	Bulgaria
337	Albania	Albania
338	Greece	Greece
33x	E.Europe	Eastern Europe
340	W.MedBasin	Western Mediterranean Basin
341	Corsica	Corsica
342	Sardinia	Sardinia
343	Sicily	Sicily
344	BalaericIs	Balaeric Islands
345	BayBiscay	Bay of Biscay
34x	W.Mediter	Western Mediterranean
350	E.MedBasin	Eastern Mediterranean Basin
351	AdriatSea	Adriatic Sea
352	AegeanSea	Aegean Sea
353	Crete	Crete
354	Cyprus	Cyprus
35x	E.Mediter	Eastern Mediterranean
3xx	Europe	Europe
400	RussPlat	Russian Platform
401	Estonia	Estonia
402	Latvia	Latvia
403	Lithuania	Lithuania
404	Belorussia	Belorussia
405	Ukrainia	Ukrainia
406	Moldavia	Moldavia
407	BlackSea	Black Sea
40x	W.USSR	Western USSR

Code	Area Abbrev.	Area Full Name
410	Kazakhstan	Kazakhstan
411	Kirgiziya	Kirgiziya
412	Takzhik	Takzhikistan
413	Uzbekist	Uzbekistan
414	Turkmeniya	Turkmeniya
415	CaspianSea	Caspian Sea
416	Azerbaydz	Azerbaykzhan
417	Armenia	Armenia
418	SovGeorgia	Georgia (USSR)
41x	SC.USSR	South Central USSR
420	FranzJfLd	Franz Josef Land
421	NovZemlya	Novaya Zemlya
422	SevZemlya	Severnaya Aemlya
423	KaraSea	Kara Sea
424	Taymir	Taymir
425	SiberianPl	Siberian Platform
426	AltaySayan	Altay Sayan
427	W.SibLowld	Western Siberian Lowlands
428	Urals	Ural Mountains
42x	NC.USSR	North Central USSR
430	LaptevSea	Laptev Sea
431	NovosibIs	Novaya Zemlya
432	ChukchiSea	Chukchi Sea
433	NE.USSR	Northeastern USSR
434	Kamchatka	Kamchatka
435	OkhotskSea	Sea of Okhotsk
436	KurilIs	Kuril Islands
437	SakhalinIs	Sakhalin Island
438	SE.USSR	Southeastern USSR
439	Transbaik	Transbaikalia
43x	E.USSR	Eastern USSR
44x	Mongolia	Mongolia
4xx	USSR&Mong	USSR and Mongolia
500	Turkey	Turkey
501	Syria	Syria
502	Lebanon	Lebanon
503	Jordan	Jordan
504	Israel	Israel
50x	NearEast	Near East
510	Iraq	Iraq
511	Iran	Iran
512	Afghanistn	Afghanistan
513	PersianGf	Persian Gulf
51x	Persia	Persia
520	SaudArabia	Saudi Arabia
521	Kuwait	Kuwait
522	Qatar	Qatar
523	UnArabEmir	United Arab Emirates
524	Oman	Oman
525	PDR.Yemen	People's Democratic Republic of Yemen
526	Yemen	Yemen (North)

Code	Area_Abbrev.	Area_Full_Name
527	ArabianSh	Arabian Shelf Area
528	GulfAden	Gulf of Aden
529	RedSea	Red Sea
52x	ArabianPen	Arabian Peninsula
530	Pakistan	Pakistan
531	India	India
532	Nepal	Nepal
533	Bhutan	Bhutan
534	Bangladesh	Bangladesh
535	SriLanka	Sri Lanka
536	E.IndiaSh	East Indian Shelf Area
537	W.IndiaSh	West Indian Shelf Area
53x	IndSubcont	Indian Subcontinent
5xx	MidEast/India	Middle East and India
600	Hokkaido	Hokkaido
601	Honshu	Honshu
602	RyukyuIs	Ryukyu Islands
603	SE.JapanSh	Southeastern Japanese shelf area
604	SeaJapan	Sea of Japan
605	S.Korea	South Korea
606	N.Korea	North Korea
60x	JapanKorea	Japan and Korea
610	Heilongjng	Heilongjiang
611	Jilin	Jilin
612	Liaoning	Liaoning
613	Hebei	Hebei
614	Shanxi	Shanxi
615	Shaanxi	Shaanxi
616	NeiMonggol	Nei Monggol
61x	NE.China	Northeastern China
620	Shandong	Shandong
621	YellowSea	Yellow Sea
622	Jiangsu	Jiangsu
623	Anhui	Anhui
624	Henan	Henan
625	Hubei	Hubei
626	Sichuan	Sichuan
62x	EC.China	East Central China
630	E.ChinaSea	East China Sea
631	Zhejiang	Zhejiang
632	Taiwan	Taiwan
633	Fujian	Fujian
634	Jiangxi	Jiangxi
635	Guangdong	Guangdong
636	Hunan	Hunan
637	Guangxi	Guangxi
638	Guizhou	Guizhou
639	S.ChinaSea	South China Sea
63x	SE.China	Southeast China
640	Xinjiang	Xinjiang
641	Gansu	Gansu

Code	Area Abbrev.	Area Full Name
642	Ningxia	Ningxia
643	Qinghai	Qinghai
644	Xizang	Xizang
645	Yunnan	Yunnan
64x	W.China	Western China
650	N.Vietnam	North Vietnam
651	S.Vietnam	South Vietnam
652	Laos	Laos
653	Cambodia	Cambodia
654	Thailand	Thailand
655	GulfThai	Gulf of Thailand
656	Burma	Burma
657	AndamanSea	Andaman Sea
658	AndamanIs	Andaman Islands
659	Malaysia	Malaysia
65x	Indochina	Indochina
660	Marianas	Marianas
661	PhilippSea	Philippine Sea
662	PhilippIs	Philippine Islands
663	SuluSea	Sulu Sea
66x	Philippins	Philippines
670	Sumatra	Sumatra
671	Borneo	Borneo
672	Sulawesi	Sulawesi
673	CelebesBs	Celebes Basin
674	Moluccas	Moluccas
675	BandaSea	Banda Sea
676	BandaArc	Banda Arc
677	Java	Java
678	JavaSea	Java Sea
679	SundaShelf	Sunda Shelf
67x	Indonesia	Indonesia
6xx	FarEast	Far East
700	Tunisia	Tunisia
701	Algeria	Algeria
702	Mali	Mali
703	Senegal	Senegal
704	Gambia	Gambia
705	Mauritania	Mauritania
706	Wn.Sahara	Western Sahara
707	Morocco	Morocco
708	NW.AfricSh	Northwestern Africa shelf area
70x	NW.Africa	Northwestern Africa
710	Libya	Libya
711	Egypt	Egypt (United Arab Republic)
712	Sudan	Sudan
713	LibyanSh	Libyan shelf area
71x	NE.Africa	Northeastern Africa
720	Ethiopia	Ethiopia
721	Djibouti	Djibouti
722	Somalia	Somalia

Code	Area Abbrev.	Area Full Name
723	Kenya	Kenya
724	Uganda	Uganda
725	Tanzania	Tanzania
726	Rwanda	Rwanda
727	Burundi	Burundi
728	Malawi	Malawi
729	E.AfricaSh	East Africa shelf area
72x	E.Africa	East Africa
730	Namibia	Namibia
731	Botswana	Botswana
732	Zimbabwe	Zimbabwe
733	Mozambique	Mozambique
734	S.Africa	South Africa
735	Swaziland	Swaziland
736	Lesotho	Lesotho
737	Sn.AfricSh	Southern Africa shelf area
73x	Sn.Africa	Southern Africa
740	Zaire	Zaire
741	Zambia	Zambia
742	Angola	Angola
743	SC.AfricSh	South Central Africa shelf area
74x	SC.Africa	South Central Africa
750	Niger	Niger
751	Chad	Chad
752	CentAfrRep	Central African Republic
753	Congo	Congo
754	Gabon	Gabon
755	EquaGuinea	Equatorial Guinea
756	Cameroon	Cameroon
757	Nigeria	Nigeria
758	GfGuineaSh	Gulf of Guinea shelf
75x	CenAfrica	Central Africa
760	Burkino Faso	Burkino Faso (Upper Volta)
761	Benin	Benin
762	Togo	Togo
763	Ghana	Ghana
764	IvoryCoast	Ivory Coast
765	Liberia	Liberia
766	SierraLeon	Sierra Leone
767	Guinea	Guinea
768	GuineaBiss	Guinea Bisseau
769	WC.AfricSh	West Central Africa shelf area
76x	WC.Africa	West Central Africa
7xx	Africa	Africa
800	N.Territry	Northern Territory
801	S.Austral	South Australia
802	Wn.Austral	Western Australia
803	GrtAustBgt	Great Australian Bight
804	W.AustrlSh	Western Australia shelf area
805	NW.AustrSh	Northwestern Australian shelf
80x	W.Austral	Western Australia

Code	Area_Abbrev.	Area_Full_Name
810	NewGuinea	New Guinea
811	Queensland	Queensland
812	NewS.Wales	New South Wales
813	Victoria	Victoria
814	Tasmania	Tasmania
815	ArafuraSea	Arafura Sea
816	GrtBarReef	Great Barrier Reef
817	SE.AustrSh	Southeastern Australian shelf area
818	BassStrait	Bass Strait
81x	E.Austral	Eastern Australia
820	BismarkArc	Bismark Archipeligo
821	NewBritIs	New Britian Island
822	BismarkSea	Bismark Sea
823	SolomonIs	Solomon Islands
824	NewHebride	New Hebrides
825	N.FijiPlat	North Fiji Plateau
82x	Melanesia	Melanesia
830	Ton-KerArc	Tonga-Kermadec Arc
831	Lau-HavrBs	Lau-Havre Basin
832	Lau-ColvRg	Lau-Colville Ridge
833	S.FijiBas	South Fiji Basin
83x	Ton-KerSys	Tonga-Kermadec System
840	N.IsNZeal	North Island New Zealand
841	S.IsNZeal	South Island New Zealand
842	ChathamRs	Chatham Rise
843	TasmanSea	Tasman Sea
844	LordHoweRs	Lord Howe Rise
845	NewCaledBs	New Caledonia Basin
846	NewCaledon	New Caledonia
847	CoralSea	Coral Sea
848	MacquierRg	Macquierie Ridge
849	CampbellPl	Campbell Plateau
84x	NewZealand	New Zealand
850	PowellBs	Powell Basin
851	S.OrkneyIs	South Orkney Islands
852	S.ShetldIs	South Shetland Islands
853	W.AntarcPn	West Antarctic Peninsula
854	AlexandrIs	Alexander Island
855	EllswrthLd	Ellsworth Land
856	M.ByrdLand	Marie Byrd Land
857	RonneIceSh	Ronne Ice Shelf
858	RossSea	Ross Sea
85x	W.Antarct	Western Antarctica
860	TransantMt	Transantarctic Mountains
861	VictoriaLd	Victoria Land
862	WilkesLand	Wilkes Land
863	AmeryIceSh	Amery Ice Shelf and Basin
864	EnderbyLd	Enderby Land
865	D.MaudLand	Dronning Maud Land
866	PensacolMt	Pensacola Mountains
867	E.AntarcSh	Eastern Antarctic shelf area

Code	Area_Abbrev.	Area_Full_Name
868	GunnerusRg	Gunnerus Ridge
86x	E.Antarct	Eastern Antarctica
8xx	AustrAntar	Australia and Antarctica
900	CanadaBs	Canada Basin
901	ChukchiCap	Chukchi Cap
902	AlphMendRg	Alpha Mendeleev Ridge
903	MakarovBs	Makarov Basin
904	LomonosRg	Lomonosov Ridge
905	EurasiaBs	Eurasia Basin
906	ArcMidOcRg	Arctic Mid-Ocean Ridge
90x	ArcticOc	Arctic Ocean
910	GreenlndBs	Greenland Basin
911	JanMayenRg	Jan Mayen and Mohns Ridge
912	NorwegBs	Norwegian Basin
913	Iceland	Iceland
914	IcelandBs	Iceland Basin
915	ReykjaneRg	Reykjanes Ridge
916	IrmingerBs	Irminger Basin
917	LabradorBs	Labrador Basin
918	BaffinBs	Baffin Basin
919	NaresStrt	Nares Strait
91x	N.Atlantic	North Atlantic Ocean
920	NW.AtlanBs	Western North Atlantic Basin
921	NewEngSmts	New England Seamounts
922	Bermuda	Bermuda
923	NE.AtlanBs	Eastern North Atlantic Basin
924	AzoresRg	Azores Ridge
925	CapeVerdBs	Cape Verde Basin
926	Made-CanIs	Madeira Islands - Canary Island
927	MeteorSmts	Meteor Seamounts
928	CapeVerdIs	Cape Verde Islands
929	N.MidAtlRg	North Mid-Atlantic Ridge
92x	C.Atlantic	Central Atlantic
930	GuyanaBs	Guyana Basin
931	BrazilBs	Brazilian Basin
932	RioGdePlat	Rio Grande Plateau
933	ArgentBs	Argentine Basin
934	S.LeoGuiBs	Sierra Leone - Guinea Basin
935	AngolaBs	Angola Basin
936	WalvisRg	Walvis Ridge
937	CapeBasin	Cape Basin
938	AgulhasBs	Agulhas Basin
939	S.MidAtlRg	Southern Mid-Atlantic Ridge
93x	S.AtlantOc	South Atlantic Ocean
940	ArabianBs	Arabian Basin
941	Chag-Lacad	Chagos - Lacadive
942	C.IndianRg	Central Indian Ridge
943	SomaliBs	Somali Basin
944	MascSeyPla	Mascarene - Seychelles Plateau
945	MascMadaBs	Mascarene - Madagascar Basin

Code	Area_Abbrev.	Area_Full_Name
946	Madagascar	Madagascar (Malagasy Republic) and Madagascar Ridge
947	SWIndianRg	Southwestern Indian Ridge
948	MozambiqBs	Mozambique Basin
949	AgulMozRg	Agulhas - Mozambique Plateau
94x	W.IndianOc	Western Indian Ocean
950	BayBengal	Bay of Bengal
951	MidIndBs	Mid-Indian Ocean Basin
952	90E.Ridge	90 East Ridge
953	WhartonBs	Wharton Basin
954	N.AustraBs	Northern Australian Basin
955	SE.IndRg	Southeast Indian Ridge
956	CuvBsExPla	Cuvier Basin and Exmouth Plateau
957	BrokenRg	Broken Ridge
958	NaturalPla	Naturaliste Plateau and Perth Basin
959	S.AustraBs	Southern Australian Basin
95x	E.IndianOc	East Indian Ocean
960	NW.PacifBs	Northwestern Pacific Basin
961	EmpHawIs	Emperor - Hawaiian Island Chain
962	ShatskyRs	Shatsky Rise
963	MidPacSmts	Mid-Pacific Seamounts
964	C.PacifBs	Central Pacific Basin
965	MagellSmts	Magellan Seamounts - East Mariana Basin
966	CarolineBs	Caroline Basin
967	CarolinSmt	Caroline Seamounts
968	MelanesBs	Marshall-Gilbert Seamounts and Melanesian Basin
969	OntJavaPla	Ontong Java Plateau
96x	W.PacifOc	Western Pacific Ocean
970	NE.PacifBs	Northeastern Pacific Basin
971	HessRise	Hess Rise
972	E.PacifRs	East Pacific Rise
973	GalapagoRg	Galapagos Ridge
974	CocosColBs	Cocos Ridge - Colombia Basin
975	EasIsNazRg	Easter Island - Sala y Gomez - Nazca Ridge
976	GuatemBs	Guatemala Basin
977	PeruBaurBs	Peru and Bauer Basins
978	ChileBasin	Chile Basin and Juan Fernandez Islands
979	ChileRise	Chile Rise
97x	E.PacifOc	Eastern Pacific Ocean
980	SW.PacifBs	Southwestern Pacific Basin
981	AustralRg	Austral Ridge
982	SocietyIs	Society Islands
983	TuamotuRg	Tuamotu Ridge
984	MarquesIs	Marquesas Islands
985	LineIs	Line Islands
986	SamoaIs	Samoa Islands
987	PacAntRg	Pacific Antarctic Ridge
988	ManihikPla	Manihiki Plateau and Tokelau-Phoenix Islands
989	LouisvleRg	Louisville Ridge
98x	S.PacifOc	South Pacific Ocean
990	WeddellSea	Weddell Sea

Code	Area_Abbrev.	Area_Full_Name
991	SW.InAntBs	Southwestern Indian - Antarctic Basin
992	CrozetPlat	Crozet Plateau - Del Cano Rise
993	BaellenyIs	Baelleny Island
994	KerguelPla	Kerguelen Plateau
995	AustAntBs	Australian - Antarctic Basin
996	AmundAbyPl	Amund Abyssal Plain
997	ScotiaSea	Scotia Sea
998	AmerAntRg	American - Antarctic Ridge
99x	Cir-AntOc	Circum-Antarctic Oceans
9xx	Oceans	Oceans

D2. Geographic codes (by name)

Code	Area Abbrev.	Area Full Name
952	90E.Ridge	90 East Ridge
351	AdriatSea	Adriatic Sea
352	AegeanSea	Aegean Sea
512	Afghanistn	Afghanistan
7xx	Africa	Africa
949	AgulMozRg	Agulhas - Mozambique Plateau
938	AgulhasBs	Agulhas Basin
155	Alabama	Alabama
13x	Alaska	Alaska
132	AlaskaPanh	Alaskan Panhandle
337	Albania	Albania
125	Alberta	Alberta
133	AleutIs	Aleutian Islands
854	AlexandrIs	Alexander Island
701	Algeria	Algeria
902	AlphMendRg	Alpha Mendeleev Ridge
426	AltaySayan	Altay Sayan
998	AmerAntRg	American - Antarctic Ridge
863	AmeryIceSh	Amery Ice Shelf and Basin
996	AmundAbyPl	Amund Abyssal Plain
658	AndamanIs	Andaman Islands
657	AndamanSea	Andaman Sea
742	Angola	Angola
935	AngolaBs	Angola Basin
623	Anhui	Anhui
940	ArabianBs	Arabian Basin
52x	ArabianPen	Arabian Peninsula
527	ArabianSh	Arabian Shelf Area
815	ArafuraSea	Arafura Sea
906	ArcMidOcRg	Arctic Mid-Ocean Ridge
90x	ArcticOc	Arctic Ocean
240	Argentina	Argentina
933	ArgentBs	Argentine Basin
242	ArgentSh	Argentinian Shelf Area
184	Arizona	Arizona
161	Arkansas	Arkansas
417	Armenia	Armenia
981	AustralRg	Austral Ridge
8xx	AustrAntar	Australia and Antarctica
995	AustAntBs	Australian - Antarctic Basin
323	Austria	Austria
416	Azerbaydz	Azerbaykzhan
924	AzoresRg	Azores Ridge
993	BaellenyIs	Baelleny Island
918	BaffinBs	Baffin Basin
210	Bahamas	Bahamas
203	Baja	Baja California

Code	Area_Abbrev.	Area_Full_Name
344	BalaericIs	Balaeric Islands
303	BalticSea	Baltic Sea
676	BandaArc	Banda Arc
675	BandaSea	Banda Sea
534	Bangladesh	Bangladesh
301	BarentSea	Barents Sea
818	BassStrait	Bass Strait
950	BayBengal	Bay of Bengal
345	BayBiscay	Bay of Biscay
320	Belg/Luxem	Belgium and Luxembourg
404	Belorussia	Belorussia
761	Benin	Benin
135	BeringBs	Bering Basin
134	BeringSh	Bering Shelf
922	Bermuda	Bermuda
533	Bhutan	Bhutan
820	BismarkArc	Bismark Archipeligo
822	BismarkSea	Bismark Sea
407	BlackSea	Black Sea
233	Bolivia	Bolivia
671	Borneo	Borneo
731	Botswana	Botswana
231	Brazil	Brazil
931	BrazilBs	Brazilian Basin
230	BrazilSh	Brazilian Shelf Area
126	BritColum	British Columbia
31x	BritishIs	British Isles
957	BrokenRg	Broken Ridge
336	Bulgaria	Bulgaria
760	Burkino Faso	Burkino Faso (Upper Volta)
656	Burma	Burma
727	Burundi	Burundi
194	California	California
653	Cambodia	Cambodia
756	Cameroon	Cameroon
849	CampbellPl	Campbell Plateau
900	CanadaBs	Canada Basin
937	CapeBasin	Cape Basin
925	CapeVerdBs	Cape Verde Basin
928	CapeVerdIs	Cape Verde Islands
21x	Caribbean	Caribbean
213	CaribSea	Caribbean Sea
966	CarolineBs	Caroline Basin
967	CarolinSmt	Caroline Seamounts
415	CaspianSea	Caspian Sea
673	CelebesBs	Celebes Basin
75x	CenAfrica	Central Africa
752	CentAfrRep	Central African Republic
214	Cen.Amer	Central America
92x	C.Atlantic	Central Atlantic
942	C.IndianRg	Central Indian Ridge

Code	Area_Abbrev.	Area_Full_Name
964	C.PacifBs	Central Pacific Basin
23x	Cen.SAmer	Central South America
751	Chad	Chad
941	Chag-Lacad	Chagos - Lacadive
842	ChathamRs	Chatham Rise
247	Chile	Chile
978	ChileBasin	Chile Basin and Juan Fernandez Islands
979	ChileRise	Chile Rise
248	ChileShelf	Chilean Shelf Area
901	ChukchiCap	Chukchi Cap
432	ChukchiSea	Chukchi Sea
99x	Cir-AntOc	Circum-Antarctic Oceans
974	CocosColBs	Cocos Ridge - Colombia Basin
222	Colombia	Colombia
182	Colorado	Colorado
753	Congo	Congo
847	CoralSea	Coral Sea
341	Corsica	Corsica
353	Crete	Crete
992	CrozetPlat	Crozet Plateau - Del Cano Rise
956	CuvBsExPla	Cuvier Basin and Exmouth Plateau
354	Cyprus	Cyprus
332	Czechoslov	Czechoslovakia
143	Delaware	Delaware
305	Denmark	Denmark
721	Djibouti	Djibouti
865	D.MaudLand	Dronning Maud Land
72x	E.Africa	East Africa
729	E.AfricaSh	East Africa shelf area
62x	EC.China	East Central China
630	E.ChinaSea	East China Sea
330	E.Germany	East Germany
102	E.Greenlnd	East Greenland
103	E.GrnlndSh	East Greenland Shelf
95x	E.IndianOc	East Indian Ocean
536	E.IndiaSh	East Indian Shelf Area
972	E.PacifRs	East Pacific Rise
975	EasIsNazRg	Easter Island - Sala y Gomez - Nazca Ridge
867	E.AntarcSh	Eastern Antarctic shelf area
86x	E.Antarct	Eastern Antarctica
81x	E.Austral	Eastern Australia
11x	E.Canada	Eastern Canada
117	E.CanadaSh	Eastern Canada Shelf Area
33x	E.Europe	Eastern Europe
35x	E.Mediter	Eastern Mediterranean
350	E.MedBasin	Eastern Mediterranean Basin
923	NE.AtlanBs	Eastern North Atlantic Basin
97x	E.PacifOc	Eastern Pacific Ocean
43x	E.USSR	Eastern USSR
221	Ecuador	Ecuador
711	Egypt	Egypt (United Arab Republic)

Code	Area_Abbrev.	Area_Full_Name
855	EllswrthLd	Ellsworth Land
961	EmpHawIs	Emperor - Hawaiian Island Chain
864	EnderbyLd	Enderby Land
312	England	England
313	EnglChnl	English Channel
755	EquaGuinea	Equatorial Guinea
401	Estonia	Estonia
720	Ethiopia	Ethiopia
905	EurasiaBs	Eurasia Basin
3xx	Europe	Europe
318	FaeroeSh	Faeroe Shelf
243	FalklandIs	Falkland Islands
244	FalklndPla	Falkland Islands Plateau
6xx	FarEast	Far East
302	Finland	Finland
154	Florida	Florida
326	France	France
420	FranzJfLd	Franz Josef Land
226	FrenGuyana	French Guyana
633	Fujian	Fujian
754	Gabon	Gabon
973	GalapagoRg	Galapagos Ridge
704	Gambia	Gambia
641	Gansu	Gansu
153	Georgia	Georgia
418	SovGeorgia	Georgia (USSR)
763	Ghana	Ghana
803	GrtAustBgt	Great Australian Bight
816	GrtBarReef	Great Barrier Reef
211	GrtAntill	Greater Antilles
338	Greece	Greece
10x	Greenland	Greenland
910	GreenlndBs	Greenland Basin
635	Guangdong	Guangdong
637	Guangxi	Guangxi
976	GuatemBs	Guatemala Basin
767	Guinea	Guinea
768	GuineaBiss	Guinea Bisseau
638	Guizhou	Guizhou
528	GulfAden	Gulf of Aden
202	GulfCal	Gulf of California
758	GfGuineaSh	Gulf of Guinea shelf
201	GulfMexico	Gulf of Mexico
116	G.StLawren	Gulf of St. Lawrence
655	GulfThai	Gulf of Thailand
868	GunnerusRg	Gunnerus Ridge
224	Guyana	Guyana
930	GuyanaBs	Guyana Basin
613	Hebei	Hebei
610	Heilongjng	Heilongjiang
624	Henan	Henan

Code	Area_Abbrev.	Area_Full_Name
971	HessRise	Hess Rise
600	Hokkaido	Hokkaido
601	Honshu	Honshu
625	Hubei	Hubei
121	HudsonBay	Hudson Bay
636	Hunan	Hunan
333	Hungary	Hungary
913	Iceland	Iceland
914	IcelandBs	Iceland Basin
191	Idaho	Idaho
175	Illinois	Illinois
531	India	India
53x	IndSubcont	Indian Subcontinent
174	Indiana	Indiana
65x	Indochina	Indochina
67x	Indonesia	Indonesia
176	Iowa	Iowa
511	Iran	Iran
510	Iraq	Iraq
315	Ireland	Ireland
314	IrishSea	Irish Sea
916	IrmingerBs	Irminger Basin
504	Israel	Israel
325	Italy	Italy
764	IvoryCoast	Ivory Coast
911	JanMayenRg	Jan Mayen and Mohns Ridge
60x	JapanKorea	Japan and Korea
677	Java	Java
678	JavaSea	Java Sea
622	Jiangsu	Jiangsu
634	Jiangxi	Jiangxi
611	Jilin	Jilin
503	Jordan	Jordan
434	Kamchatka	Kamchatka
166	Kansas	Kansas
423	KaraSea	Kara Sea
410	Kazakhstan	Kazakhstan
157	Kentucky	Kentucky
723	Kenya	Kenya
994	KerguelPla	Kerguelen Plateau
411	Kirgiziya	Kirgiziya
436	KurilIs	Kuril Islands
521	Kuwait	Kuwait
112	Labrador	Labrador
917	LabradorBs	Labrador Basin
652	Laos	Laos
430	LaptevSea	Laptev Sea
402	Latvia	Latvia
832	Lau-ColvRg	Lau-Colville Ridge
831	Lau-HavrBs	Lau-Havre Basin
502	Lebanon	Lebanon

Code	Area_Abbrev.	Area_Full_Name
736	Lesotho	Lesotho
212	LsrAntill	Lesser Antilles
612	Liaoning	Liaoning
765	Liberia	Liberia
710	Libya	Libya
713	LibyanSh	Libyan shelf area
985	LineIs	Line Islands
403	Lithuania	Lithuania
904	LomonosRg	Lomonosov Ridge
844	LordHoweRs	Lord Howe Rise
163	Louisiana	Louisiana
989	LouisvleRg	Louisville Ridge
848	MacquierRg	Macquierie Ridge
946	Madagascar	Madagascar (Malagasy Republic) and Madagascar Ridge
926	Made-CanIs	Madeira Islands - Canary Island
965	MagellSmts	Magellan Seamounts - East Mariana Basin
903	MakarovBs	Makarov Basin
728	Malawi	Malawi
659	Malaysia	Malaysia
702	Mali	Mali
988	ManihikPla	Manihiki Plateau and Tokelau-Phoenix Islands
123	Manitoba	Manitoba
660	Marianas	Marianas
856	M.ByrdLand	Marie Byrd Land
984	MarquesIs	Marquesas Islands
968	MelanesBs	Marshall-Gilbert Seamounts and Melanesian Basin
144	Maryland	Maryland
945	MascMadaBs	Mascarene - Madagascar Basin
944	MascSeyPla	Mascarene - Seychelles Plateau
705	Mauritania	Mauritania
82x	Melanesia	Melanesia
927	MeteorSmts	Meteor Seamounts
20x	Mexico	Mexico
200	MexicoS.S.	Mexico sensu stricto
172	Michigan	Michigan
951	MidIndBs	Mid-Indian Ocean Basin
963	MidPacSmts	Mid-Pacific Seamounts
2xx	Mid&SAmer	Middle and South America
5xx	MidEast/India	Middle East and India
170	Minnesota	Minnesota
162	Mississipp	Mississippi
160	Missouri	Missouri
406	Moldavia	Moldavia
674	Moluccas	Moluccas
44x	Mongolia	Mongolia
180	Montana	Montana
707	Morocco	Morocco
733	Mozambique	Mozambique
948	MozambiqBs	Mozambique Basin
730	Namibia	Namibia

Code	Area Abbrev.	Area Full Name
919	NaresStrt	Nares Strait
958	NaturalPla	Naturaliste Plateau and Perth Basin
50x	NearEast	Near East
177	Nebraska	Nebraska
616	NeiMonggol	Nei Monggol
532	Nepal	Nepal
321	Netherlnds	Netherlands
193	Nevada	Nevada
821	NewBritIs	New Britian Island
115	NewBrunsw	New Brunswick
846	NewCaledon	New Caledonia
845	NewCaledBs	New Caledonia Basin
140	NewEngland	New England
921	NewEngSmts	New England Seamounts
810	NewGuinea	New Guinea
824	NewHebride	New Hebrides
142	NewJersey	New Jersey
183	NewMexico	New Mexico
812	NewS.Wales	New South Wales
147	NewYork	New York
84x	NewZealand	New Zealand
111	Newfndland	Newfoundland
750	Niger	Niger
757	Nigeria	Nigeria
642	Ningxia	Ningxia
1xx	N.America	North America
91x	N.Atlantic	North Atlantic Ocean
151	N.Carolina	North Carolina
17x	NC.USA	North Central United States
42x	NC.USSR	North Central USSR
179	N.Dakota	North Dakota
825	N.FijiPlat	North Fiji Plateau
100	N.Greenlnd	North Greenland
101	N.GrnlndSh	North Greenland Shelf
840	N.IsNZeal	North Island New Zealand
606	N.Korea	North Korea
929	N.MidAtlRg	North Mid-Atlantic Ridge
310	NorthSea	North Sea
650	N.Vietnam	North Vietnam
120	NW.Terr	North West Territories
220	NW.SAmerSh	North Western Shelf Area South America
14x	NE.USA	Northeast United States
71x	NE.Africa	Northeastern Africa
61x	NE.China	Northeastern China
970	NE.PacifBs	Northeastern Pacific Basin
141	NE.USASh	Northeastern USA Shelf Area
433	NE.USSR	Northeastern USSR
130	N.Alaska	Northern Alaska
954	N.AustraBs	Northern Australian Basin
227	N.SAmerSh	Northern Shelf Area South America
22x	N.SAmerica	Northern South America

Code	Area_Abbrev.	Area_Full_Name
800	N.Territry	Northern Territory
70x	NW.Africa	Northwestern Africa
708	NW.AfricSh	Northwestern Africa shelf area
805	NW.AustrSh	Northwestern Australian shelf
960	NW.PacifBs	Northwestern Pacific Basin
306	Norway	Norway
912	NorwegBs	Norwegian Basin
307	NorwaySh	Norwegian Shelf Area
114	NovaScotia	Nova Scotia
245	N.ScotiaRg	Nova Scotia Ridge
421	NovZemlya	Novaya Zemlya
431	NovosibIs	Novaya Zemlya
9xx	Oceans	Oceans
173	Ohio	Ohio
165	Oklahoma	Oklahoma
524	Oman	Oman
122	Ontario	Ontario
969	OntJavaPla	Ontong Java Plateau
192	Oregon	Oregon
987	PacAntRg	Pacific Antarctic Ridge
530	Pakistan	Pakistan
232	Paraguay	Paraguay
146	Pennsylvan	Pennsylvania
866	PensacolMt	Pensacola Mountains
525	PDR.Yemen	People's Democratic Republic of Yemen
51x	Persia	Persia
513	PersianGf	Persian Gulf
234	Peru	Peru
977	PeruBaurBs	Peru and Bauer Basins
235	PeruShelf	Peruvian Shelf Area
662	PhilippIs	Philippine Islands
661	PhilippSea	Philippine Sea
66x	Philippins	Philippines
331	Poland	Poland
329	Portugal	Portugal
850	PowellBs	Powell Basin
113	PrEdwIsl	Prince Edward Island
522	Qatar	Qatar
643	Qinghai	Qinghai
110	Quebec	Quebec
811	Queensland	Queensland
529	RedSea	Red Sea
915	ReykjaneRg	Reykjanes Ridge
932	RioGdePlat	Rio Grande Plateau
317	RockallPla	Rockall Plateau
18x	RockyMtUSA	Rocky Mountain United States
334	Romania	Romania
857	RonneIceSh	Ronne Ice Shelf
858	RossSea	Ross Sea
400	RussPlat	Russian Platform
726	Rwanda	Rwanda

Code	Area Abbrev.	Area Full Name
602	RyukyuIs	Ryukyu Islands
437	SakhalinIs	Sakhalin Island
986	SamoaIs	Samoa Islands
342	Sardinia	Sardinia
124	Saskatch	Saskatchewan
520	SaudArabia	Saudi Arabia
30x	Scandinav	Scandinavia
249	ScotiaArc	Scotia Arc
997	ScotiaSea	Scotia Sea
311	Scotland	Scotland
604	SeaJapan	Sea of Japan
435	OkhotskSea	Sea of Okhotsk
703	Senegal	Senegal
422	SevZemlya	Severnaya Aemlya
615	Shaanxi	Shaanxi
620	Shandong	Shandong
614	Shanxi	Shanxi
962	ShatskyRs	Shatsky Rise
425	SiberianPl	Siberian Platform
626	Sichuan	Sichuan
343	Sicily	Sicily
766	SierraLeon	Sierra Leone
934	S.LeoGuiBs	Sierra Leone - Guinea Basin
982	SocietyIs	Society Islands
823	SolomonIs	Solomon Islands
943	SomaliBs	Somali Basin
722	Somalia	Somalia
734	S.Africa	South Africa
93x	S.AtlantOc	South Atlantic Ocean
801	S.Austral	South Australia
152	S.Carolina	South Carolina
74x	SC.Africa	South Central Africa
743	SC.AfricSh	South Central Africa shelf area
16x	SC.USA	South Central United States
167	SC.USASh	South Central USA Shelf Area
41x	SC.USSR	South Central USSR
639	S.ChinaSea	South China Sea
178	S.Dakota	South Dakota
833	S.FijiBas	South Fiji Basin
246	S.GeorgIs	South Georgia Island
841	S.IsNZeal	South Island New Zealand
605	S.Korea	South Korea
851	S.OrkneyIs	South Orkney Islands
98x	S.PacifOc	South Pacific Ocean
852	S.ShetldIs	South Shetland Islands
651	S.Vietnam	South Vietnam
63x	SE.China	Southeast China
955	SE.IndRg	Southeast Indian Ridge
817	SE.AustrSh	Southeastern Australian shelf area
603	SE.JapanSh	Southeastern Japanese shelf area
15x	SE.USA	Southeastern United States

Code	Area_Abbrev.	Area_Full_Name
158	SE.USASh	Southeastern USA Shelf Area
438	SE.USSR	Southeastern USSR
73x	Sn.Africa	Southern Africa
737	Sn.AfricSh	Southern Africa shelf area
131	S.Alaska	Southern Alaska
959	S.AustraBs	Southern Australian Basin
939	S.MidAtlRg	Southern Mid-Atlantic Ridge
24x	S.SAmerica	Southern South America
991	SW.InAntBs	Southwestern Indian - Antarctic Basin
947	SWIndianRg	Southwestern Indian Ridge
980	SW.PacifBs	Southwestern Pacific Basin
328	Spain	Spain
535	SriLanka	Sri Lanka
712	Sudan	Sudan
672	Sulawesi	Sulawesi
663	SuluSea	Sulu Sea
670	Sumatra	Sumatra
679	SundaShelf	Sunda Shelf
225	Surinam	Surinam
300	Svalbard	Svalbard
735	Swaziland	Swaziland
304	Sweden	Sweden
324	Switzrland	Switzerland
501	Syria	Syria
632	Taiwan	Taiwan
412	Takzhik	Takzhikistan
725	Tanzania	Tanzania
843	TasmanSea	Tasman Sea
814	Tasmania	Tasmania
424	Taymir	Taymir
156	Tennessee	Tennessee
164	Texas	Texas
654	Thailand	Thailand
762	Togo	Togo
830	Ton-KerArc	Tonga-Kermadec Arc
83x	Ton-KerSys	Tonga-Kermadec System
860	TransantMt	Transantarctic Mountains
439	Transbaik	Transbaikalia
983	TuamotuRg	Tuamotu Ridge
700	Tunisia	Tunisia
500	Turkey	Turkey
414	Turkmeniya	Turkmeniya
724	Uganda	Uganda
405	Ukrainia	Ukrainia
523	UnArabEmir	United Arab Emirates
428	Urals	Ural Mountains
241	Uruguay	Uruguay
4xx	USSR&Mong	USSR and Mongolia
185	Utah	Utah
413	Uzbekist	Uzbekistan
223	Venezuela	Venezuela

Code	Area_Abbrev.	Area_Full_Name
813	Victoria	Victoria
861	VictoriaLd	Victoria Land
150	Virginia	Virginia
319	Wales	Wales
936	WalvisRg	Walvis Ridge
190	Washington	Washington
990	WeddellSea	Weddell Sea
853	W.AntarcPn	West Antarctic Peninsula
76x	WC.Africa	West Central Africa
769	WC.AfricSh	West Central Africa shelf area
322	W.Germany	West Germany
104	W.Greenlnd	West Greenland
105	W.GrnlndSh	West Greenland Shelf
537	W.IndiaSh	West Indian Shelf Area
145	W.Virginia	West Virginia
85x	W.Antarct	Western Antarctica
802	Wn.Austral	Western Australia
80x	W.Austral	Western Australia
804	W.AustrlSh	Western Australia shelf area
316	WBritIsSh	Western British Isles Shelf Area
12x	W.Canada	Western Canada
215	W.CenAmSh	Western Central America Shelf Area
64x	W.China	Western China
32x	W.Europe	Western Europe
327	W.EuropeSh	Western Europe Shelf Area
94x	W.IndianOc	Western Indian Ocean
34x	W.Mediter	Western Mediterranean
340	W.MedBasin	Western Mediterranean Basin
920	NW.AtlanBs	Western North Atlantic Basin
96x	W.PacifOc	Western Pacific Ocean
706	Wn.Sahara	Western Sahara
204	Wn.MexSh	Western Shelf Area of Mexico
427	W.SibLowld	Western Siberian Lowlands
19x	Wn.USA	Western USA
195	W.USASh	Western USA Shelf Area
40x	W.USSR	Western USSR
953	WhartonBs	Wharton Basin
862	WilkesLand	Wilkes Land
171	Wisconsin	Wisconsin
000	World	World
181	Wyoming	Wyoming
640	Xinjiang	Xinjiang
644	Xizang	Xizang
621	YellowSea	Yellow Sea
526	Yemen	Yemen (North)
335	Yugoslavia	Yugoslavia
127	Yukon	Yukon Territory
645	Yunnan	Yunnan
740	Zaire	Zaire
741	Zambia	Zambia
631	Zhejiang	Zhejiang

Code	Area Abbrev.	Area Full Name
732	Zimbabwe	Zimbabwe

D3. Geographic Precision Codes

1 - Precise coordinates, within 1 km (equivalent to the site)

2 - Good precision, within 10 km (equivalent to the nearest town)

3 - County scale location, within 100 km (equivalent to knowing the position to within an average US county)

4 - Province scale location, within 500 km (equivalent to knowing the position to within an average US State)

5 - Very imprecise, country scale, greater than 500 km

D4. Plate codes by number

Code	Plate Name
101	North America
102	Greenland
103	Eurekan Orogen
104	Parautochthonous North America
105	Baja
106	Colorado Plateau
107	SW Ellesmere & Devon Island
108	W. Basin and Range
109	Post Paleozoic Accretion (NAM)
110	Mexico
111	Yucatan
112	Florida
113	Chortis
114	N. Cayman Ridge
115	Cuba
116	S. Cayman Ridge
117	W. Hispaniola
118	Central Hispaniola
119	Caribbean
120	Lesser Antilles
121	Puerto Rico
124	S. Mexico
125	Southern Florida
126	Panama
130	Brooks Range
131	Seward Peninsula
132	N. Angayuchen
133	S. Angayuchen, Goodnews, E.Bering Shelf
134	NE. Ruby Range
135	SW Ruby Range
136	Yukon-Tanana, Kilbuck T.
137	Greater Talkeetna Terrane
138	S. Wrangellia
139	Yakatat
140	Stikinia
141	N.Takla-Nicola, Cache Creek
142	Casiar Platform
143	Pelly Block (Pz and pC)
144	S. Takla-Nicola, Cache Creek
145	South Basin & Range (Sonora)
146	Front Range
201	South America
202	Ecuador
203	Venezuela
204	Aruba
205	Curacao

Code	Plate Name
206	Patagonia
207	Rommeral Arc
208	Sergipe Block
209	Beagle Channel Block
210	Burdwood Bank
211	Magdalena Accretion
301	Eurasia
302	Iberia
303	Hatton-Edoras Bank
304	Rockall Bank
305	Southern Bay of Biscay
306	Svalbard Platform
307	Balerics
308	Corsica - Sardinia
309	Tyrrhenian Sea - Appenines
310	Apulia + W. Greece (to Dinarides)
311	Undivided Turkey
312	Undivided Alps, Carpathians, and Caucusses
313	Alboran Sea
401	North Slope-Chukotka Block
402	Lomonosov Ridge
403	Pri-Kolymsk Block
404	Omolon Block
405	Okhotsk Massif Block
406	Alazea
407	J-K Koryak Accretion. Complex
408	Late K Eocene Kamchatka Ac C.
409	E. Kamchatka Arc
410	Olyutorsk-Shirshov Arc
411	Bowers Ridge Arc
412	Aleutian Basin
413	Aleutian Ridge
414	Verkhoyansk Orogenic Belt
415	Dzhadgi
416	West Bering Sea
431	Aldan Shield
432	Mongolia-Trans-Baikalia
433	Tarim-Tian Shan
434	Qiadam Block
435	Da Hinggan Block
436	Ala Shan Block
437	Ordos Block
438	Xi Shan
439	Korea
440	E. Shandong Block
441	W. Shandong Block
442	Xiao Hinggan Block
443	Sikhote Alin
444	Qilian Shan Block
501	India
502	Arabia

Code	Plate Name
503	Farah Block
504	Sri Lanka
505	Sistan-Helmand Block
506	Sinai
507	Makran
508	Central Iran
509	Kabul Block
510	Himalayas
601	N. Japan
602	S. Japan
603	Sea of Okhotsk Block
604	Southern Ryukyu Arc
605	North Ryukyu Arc
606	Yamato Bank Block
607	Kurile Arc
608	Hidaka
609	Sea of Japan
631	Yangtze Platform (S. China)
632	Reed Bank Block
633	Red River Block
641	N. Qiangtang Block
642	N. Lhasa Block
643	S. Qiangtang Block
644	S. Lhasa Block
645	Sungpang Ganze
646	Pamirs Block
651	Indochina Block
652	N. Sibumasu Block
653	Andaman-IndoBurmese Block
654	W. Malaysian Peninsula Block
655	E. Malaysian Peninsula Block
656	Borneo Block
660	S. Philippine Sea Plate
661	N. Philippine Sea Plate
662	Izu Bonin Arc
663	C. Mariana Block
664	E. Mariana Block
665	Luzon-E. Philippines Block
666	Sulawesi-W. Philippines Block
667	Mindoro Block
668	Celebes Sea Plate
669	Sula Sea-S. Palawan Plate
670	Macclesfield Bank Block
701	West Africa
702	Morocco
703	South Africa
704	Northeastern Africa
705	E. Africa
706	Lake Victoria-Mozambique
707	Danakil Block
801	Australia

Code	Plate Name
802	E. Antarctica
803	Marie Byrd Land Block
804	Lord Howe Rise
805	S. New Zealand
806	S. Orkney Block
807	Antarctic Peninsula Block
808	N. Coral Sea Block
809	Timor-Ceram Thrustbelt
810	Vogelkopf Block
811	Surong Prong
812	Banda Sea
813	Owen Stanley Range
814	N. New Guinea Block
815	N. Island, New Zealand and Norfolk Ridge
816	Chatham Rise
901	Chukchi Plateau (1)
902	Chukchi Plateau (2)
903	Amerasian Basin
905	Jan Mayen Block
907	Madagascar
908	Seychelles Island Plate
909	Pacific Plate
910	Nazca Plate
911	Aluk Plate
912	Drake Passage (1)
913	Drake Passage (2)
914	Cocos Plate
915	Rivera Plate
916	Juan de Fuca
917	Wharton Basin
918	Meteor Rise
919	Scotia Plate
920	E. Mascarene Basin (1)
921	E. Mascarene Basin (2)
923	Guadalupe Island
924	Mathematician Plate
925	Unnamed (24°N,113°W)
926	Berlanga Rise
927	Malpelo Ridge
928	Easter Island Plate
929	N. Caroline Sea Plate
930	S. Caroline Sea Plate
931	N. Bismark Sea Plate
932	New Hebrides Arc
933	Solomon Sea Plate
934	Louisiade Plate
935	S. Fiji Basin - Colville Ridge
936	Fiji
937	Tonga - Kermedec
938	Newbrit Arc

D5. Plates codes by name

Code	Plate Name
436	Ala Shan Block
406	Alazea
313	Alboran Sea
431	Aldan Shield
412	Aleutian Basin
413	Aleutian Ridge
911	Aluk Plate
903	Amerasian Basin
653	Andaman-IndoBurmese Block
807	Antarctic Peninsula Block
310	Apulia + W. Greece (to Dinarides)
502	Arabia
204	Aruba
801	Australia
105	Baja
307	Balerics
812	Banda Sea
209	Beagle Channel Block
926	Berlanga Rise
656	Borneo Block
411	Bowers Ridge Arc
130	Brooks Range
210	Burdwood Bank
663	C. Mariana Block
119	Caribbean
142	Casiar Platform
668	Celebes Sea Plate
118	Central Hispaniola
508	Central Iran
816	Chatham Rise
113	Chortis
901	Chukchi Plateau (1)
902	Chukchi Plateau (2)
914	Cocos Plate
106	Colorado Plateau
308	Corsica - Sardinia
115	Cuba
205	Curacao
435	Da Hinggan Block
707	Danakil Block
912	Drake Passage (1)
913	Drake Passage (2)
415	Dzhadgi
705	E. Africa
802	E. Antarctica
409	E. Kamchatka Arc

Code	Plate Name
655	E. Malaysian Peninsula Block
664	E. Mariana Block
920	E. Mascarene Basin (1)
921	E. Mascarene Basin (2)
440	E. Shandong Block
928	Easter Island Plate
202	Ecuador
301	Eurasia
103	Eurekan Orogen
503	Farah Block
936	Fiji
112	Florida
146	Front Range
137	Greater Talkeetna Terrane
102	Greenland
923	Guadalupe Island
303	Hatton-Edoras Bank
608	Hidaka
510	Himalayas
302	Iberia
501	India
651	Indochina Block
662	Izu Bonin Arc
407	J-K Koryak Accretion. Complex
905	Jan Mayen Block
916	Juan de Fuca
509	Kabul Block
439	Korea
607	Kurile Arc
706	Lake Victoria-Mozambique
408	Late K Eocene Kamchatka Ac C.
120	Lesser Antilles
402	Lomonosov Ridge
804	Lord Howe Rise
934	Louisiade Plate
665	Luzon-E. Philippines Block
670	Macclesfield Bank Block
907	Madagascar
211	Magdalena Accretion
507	Makran
927	Malpelo Ridge
803	Marie Byrd Land Block
924	Mathematician Plate
918	Meteor Rise
110	Mexico
667	Mindoro Block
432	Mongolia-Trans-Baikalia
702	Morocco
132	N. Angayuchen
931	N. Bismark Sea Plate
929	N. Caroline Sea Plate

Code	Plate Name
114	N. Cayman Ridge
808	N. Coral Sea Block
815	N. Island, New Zealand and Norfolk Ridge
601	N. Japan
642	N. Lhasa Block
814	N. New Guinea Block
661	N. Philippine Sea Plate
641	N. Qiangtang Block
652	N. Sibumasu Block
141	N.Takla-Nicola, Cache Creek
910	Nazca Plate
134	NE. Ruby Range
932	New Hebrides Arc
938	Newbrit Arc
101	North America
605	North Ryukyu Arc
401	North Slope-Chukotka Block
704	Northeastern Africa
405	Okhotsk Massif Block
410	Olyutorsk-Shirshov Arc
404	Omolon Block
437	Ordos Block
813	Owen Stanley Range
909	Pacific Plate
646	Pamirs Block
126	Panama
206	Patagonia
104	Parautochthonous North America
143	Pelly Block (Pz and pC)
109	Post Paleozoic Accretion (NAM)
403	Pri-Kolymsk Block
121	Puerto Rico
434	Qiadam Block
444	Qilian Shan Block
633	Red River Block
632	Reed Bank Block
915	Rivera Plate
304	Rockall Bank
207	Rommeral Arc
919	Scotia Plate
609	Sea of Japan
603	Sea of Okhotsk Block
208	Sergipe Block
131	Seward Peninsula
908	Seychelles Island Plate
443	Sikhote Alin
506	Sinai
505	Sistan-Helmand Block
933	Solomon Sea Plate
703	South Africa
201	South America

Code	Plate Name
133	S. Angayuchen, Goodnews, E.Bering Shelf
145	S. Basin & Range (Sonora)
930	S. Caroline Sea Plate
116	S. Cayman Ridge
935	S. Fiji Basin - Colville Ridge
602	S. Japan
644	S. Lhasa Block
124	S. Mexico
805	S. New Zealand
806	S. Orkney Block
660	S. Philippine Sea Plate
643	S. Qiangtang Block
144	S. Takla-Nicola, Cache Creek
138	S. Wrangellia
305	Southern Bay of Biscay
125	Southern Florida
604	Southern Ryukyu Arc
504	Sri Lanka
140	Stikinia
669	Sula Sea-S. Palawan Plate
666	Sulawesi-W. Philippines Block
645	Sungpang Ganze
811	Surong Prong
306	Svalbard Platform
107	SW Ellesmere & Devon Island
135	SW Ruby Range
433	Tarim-Tian Shan
809	Timor-Ceram Thrustbelt
937	Tonga - Kermedec
309	Tyrrhenian Sea - Appenines
312	Undivided Alps, Carpathians, and Caucusses
311	Undivided Turkey
925	Unnamed (24°N,113°W)
203	Venezuela
414	Verkhoyansk Orogenic Belt
810	Vogelkopf Block
701	West Africa
108	West Basin and Range
416	West Bering Sea
117	West Hispaniola
654	West Malaysian Peninsula Block
441	West Shandong Block
917	Wharton Basin
438	Xi Shan
442	Xiao Hinggan Block
139	Yakatat
606	Yamato Bank Block
631	Yangtze Platform (S. China)
111	Yucatan
136	Yukon-Tanana, Kilbuck T.

D4 & D5, supplement. Maps with Plates and Plate codes

The following maps show the distribution of Mesozoic and Cenozoic plates and plate boundaries as used by the Paleogeographic Atlas Project. All localities within the database have been assigned to one of these plates based on its present day latitude and longitude. These maps allow this assignment to be done by eye, although a computer program does exist that will do this automatically (see section D6.1).

The plate boundaries, names, codes and rotation parameters are those of the Paleogeographic Atlas Project and are primarily the work of David Rowley.

Users should note that the selection of shading for tectonic plates is arbitrary and has no intended meaning. The shading of individual plates need not be consistent between figures.

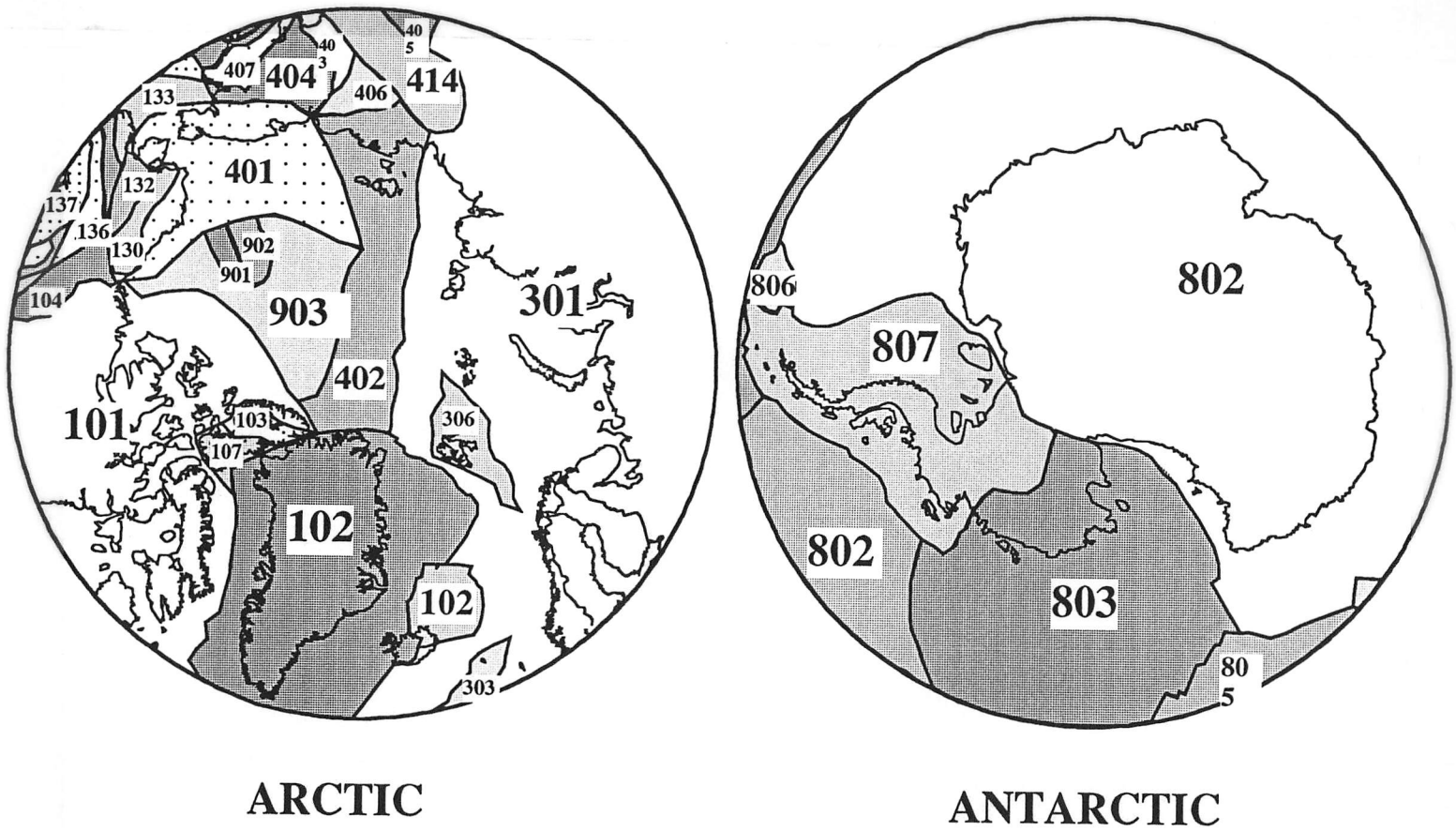


FIGURE A4.23. Maps of Antarctica and the Arctic with plate boundaries and codes (see section D4 and D5 for further information)

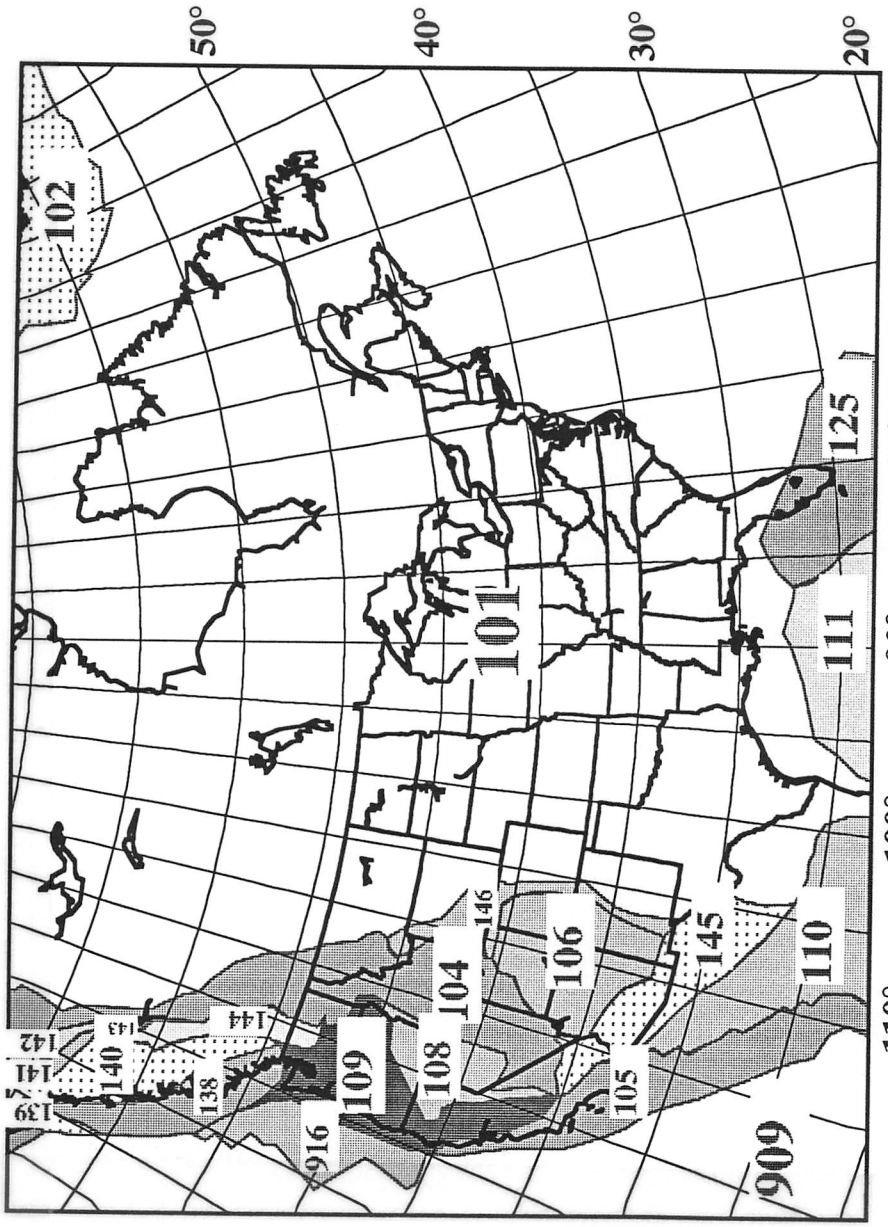


FIGURE A4.24. Map showing north american plate boundaries and plate codes.

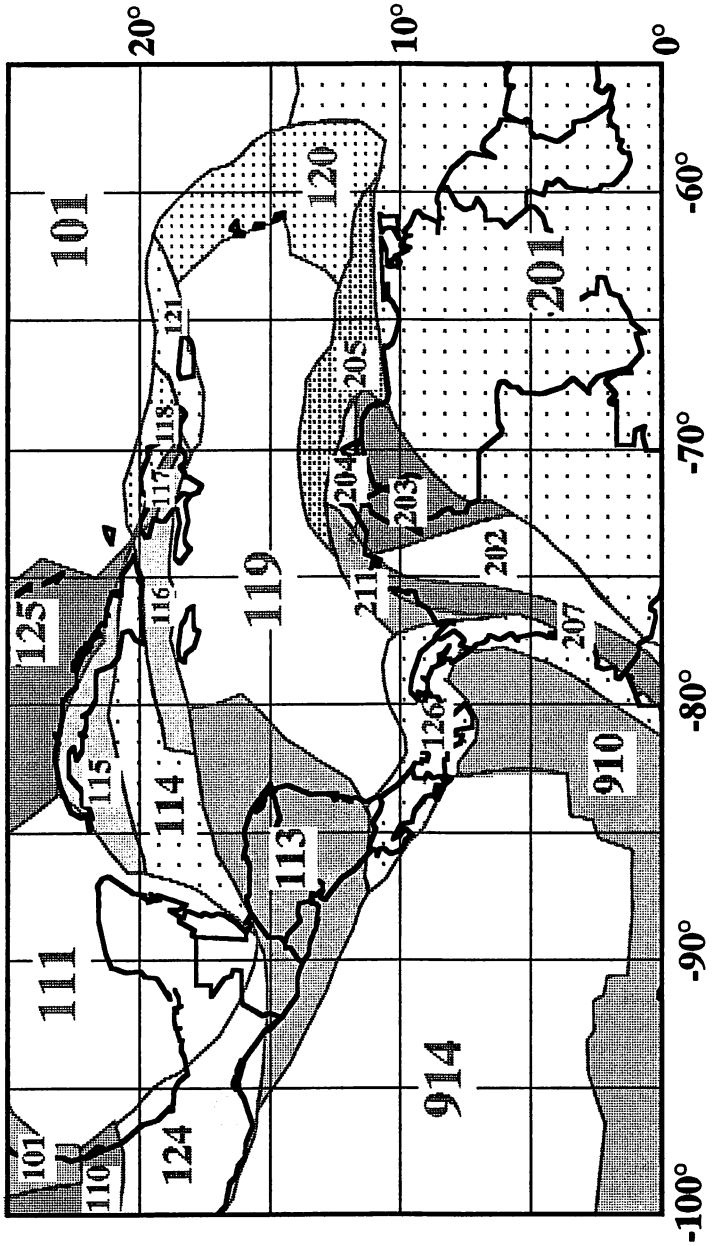


FIGURE A4.25. Map showing Caribbean and central american plate boundaries and plate codes.

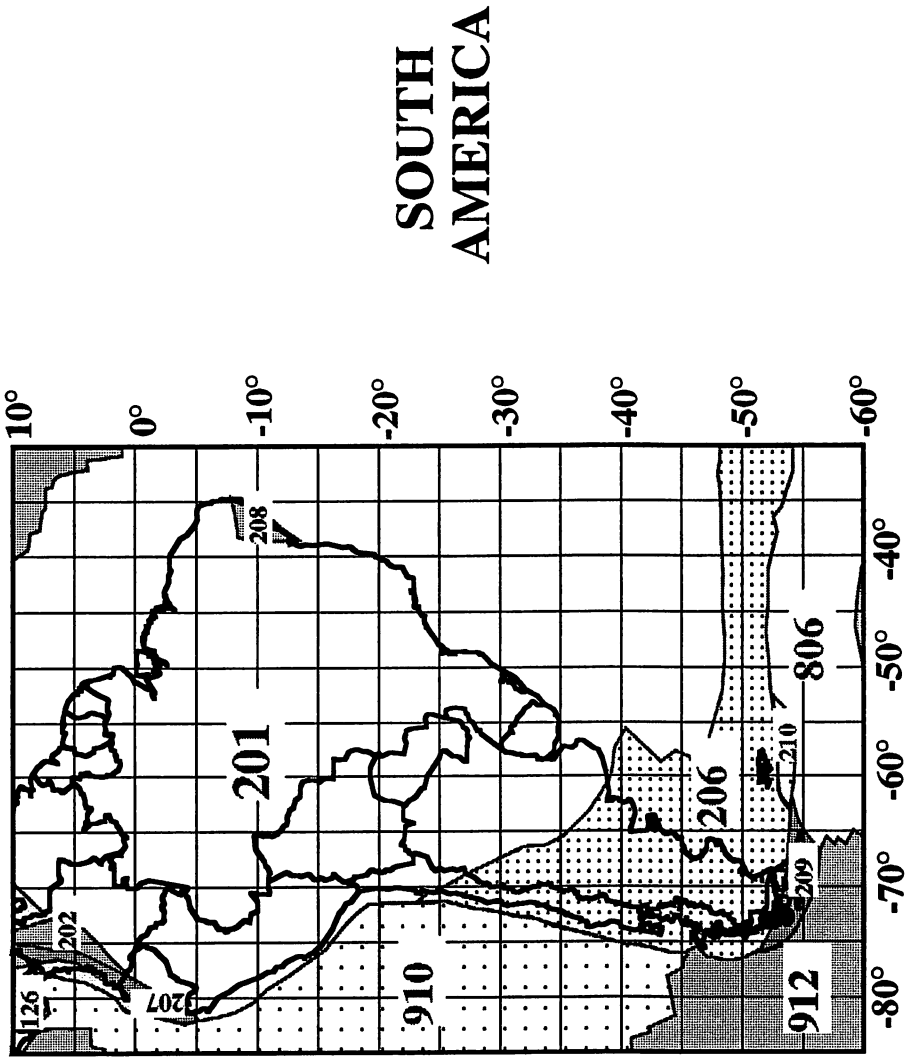


FIGURE A4.26. Map showing south american plate boundaries and plate codes.

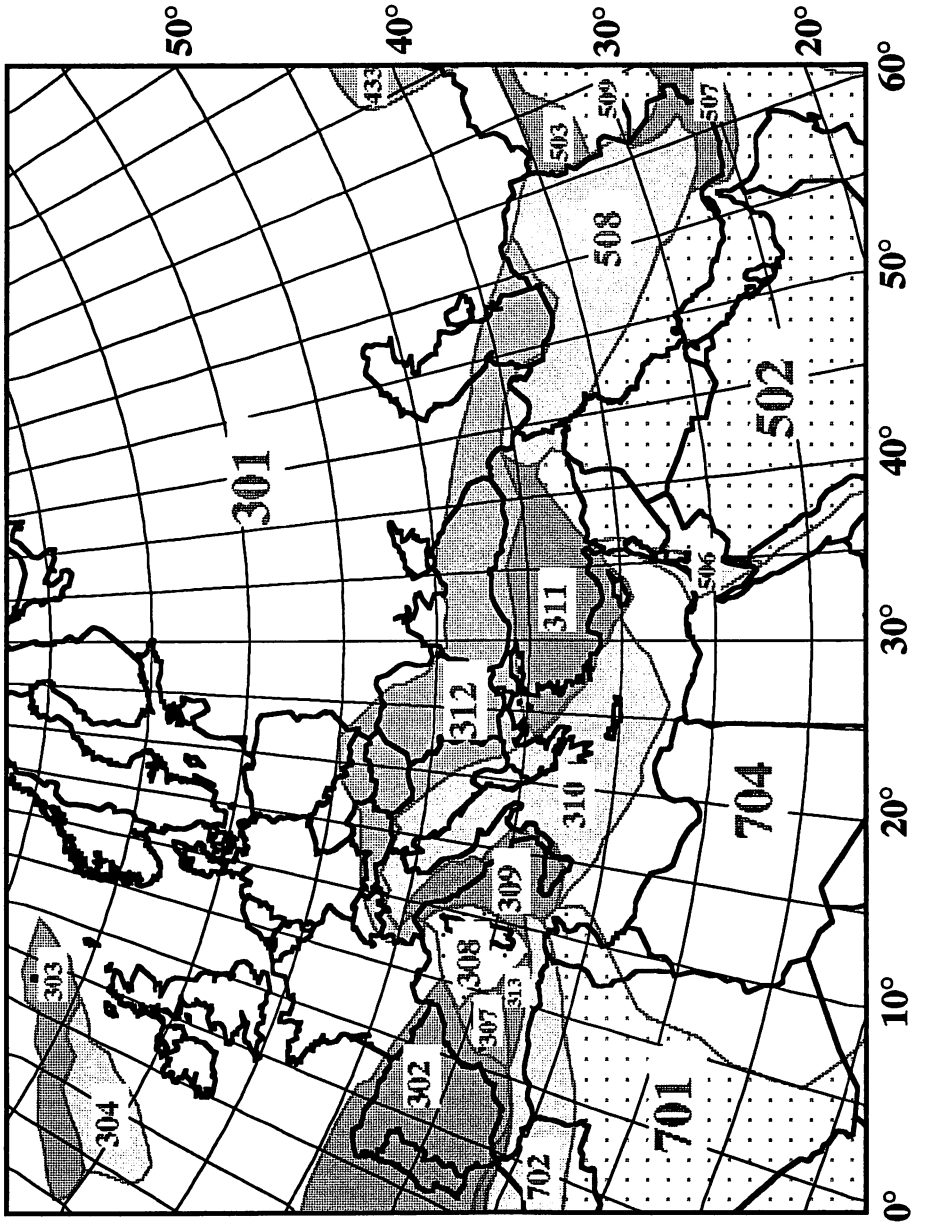


FIGURE A4.27. Map showing european plate boundaries and plate codes.

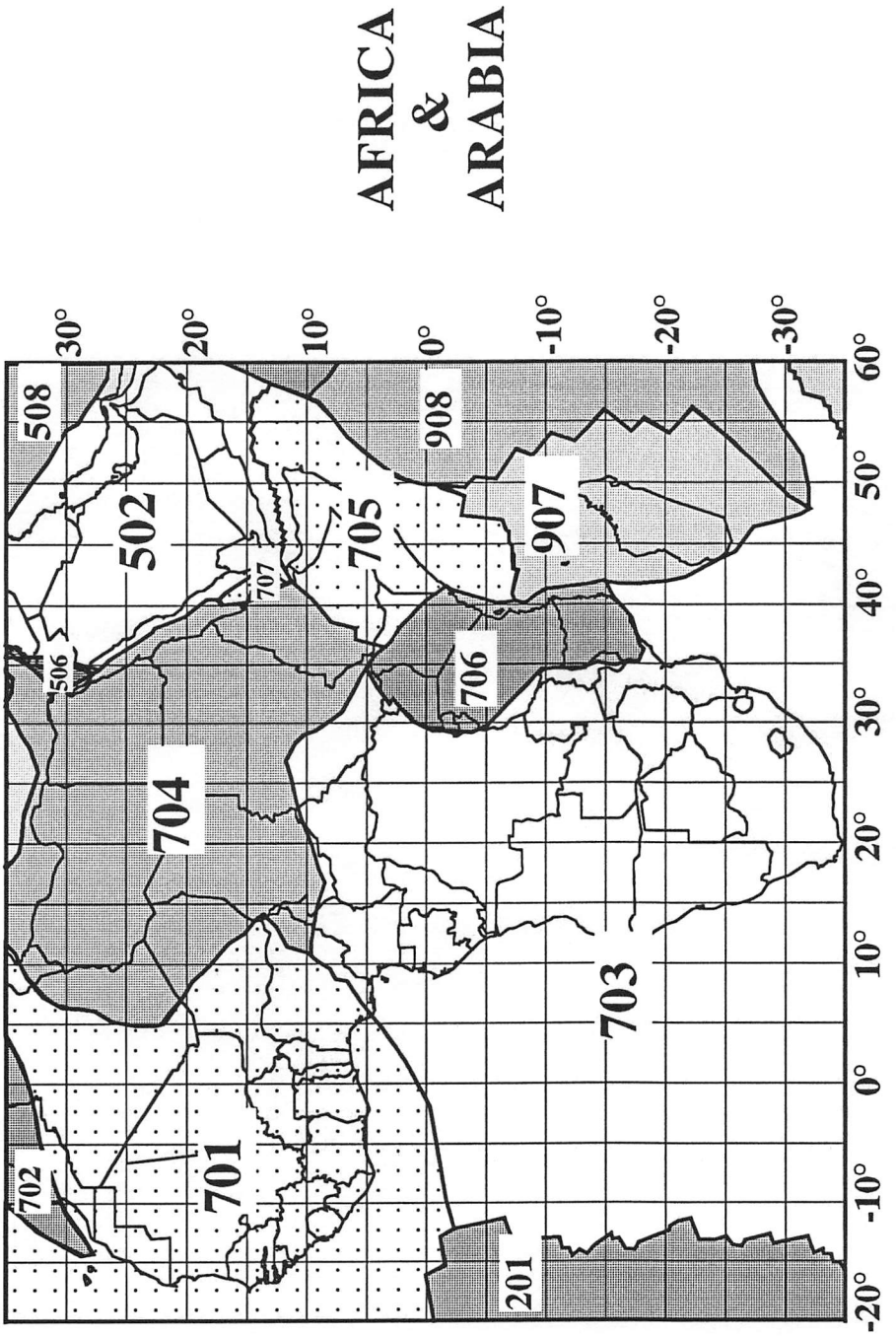


FIGURE A4.28. Map showing african and arabian plate boundaries and plate codes.

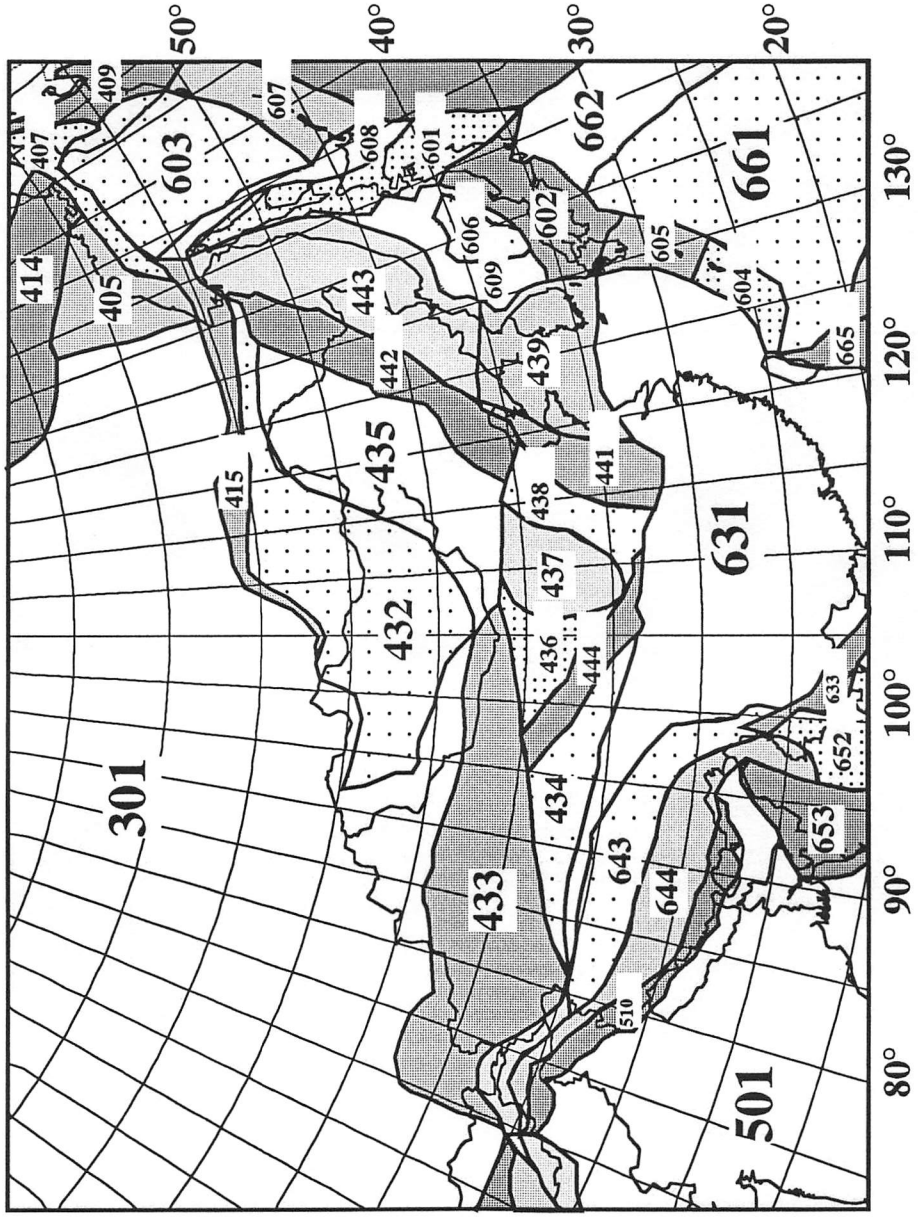


FIGURE A4.29. Map showing asian plate boundaries and plate codes.

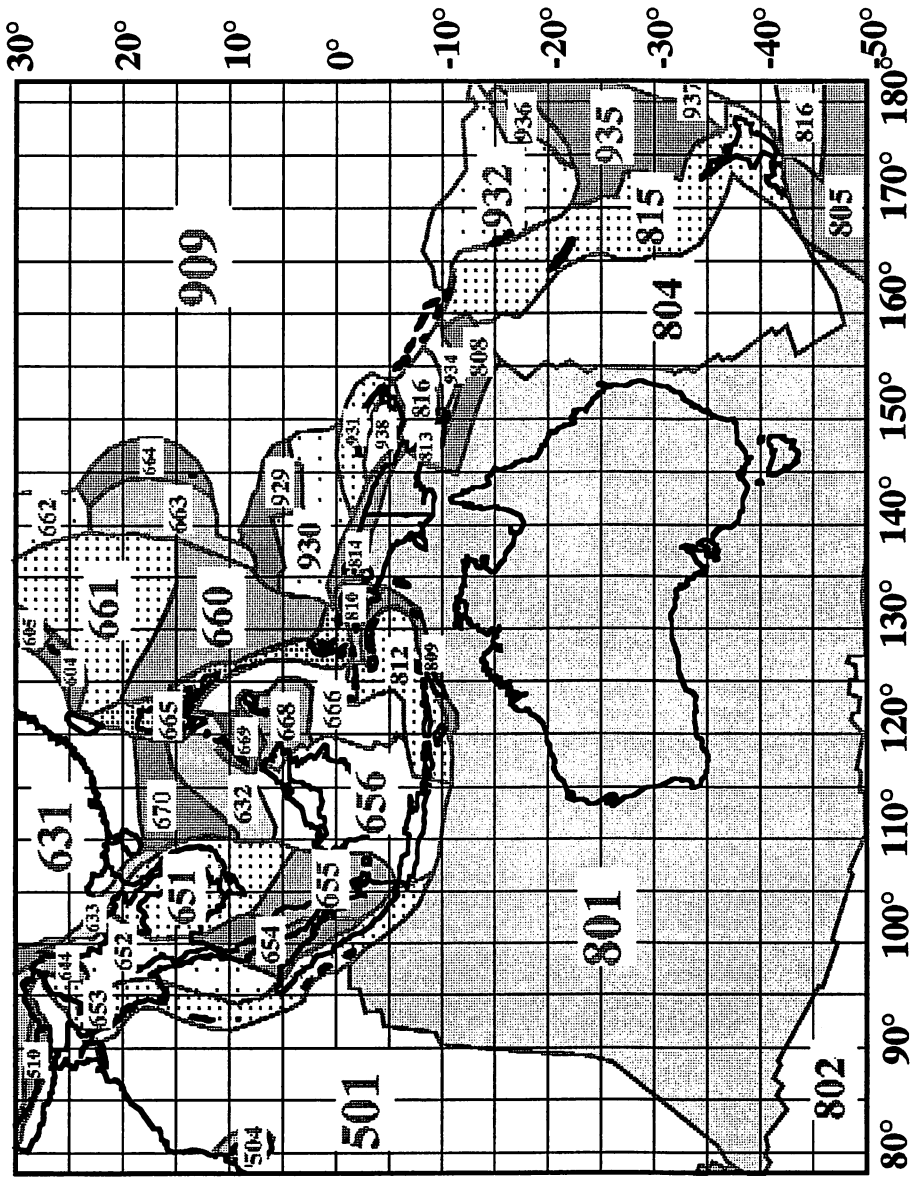


FIGURE A4.30. Map showing southeast asian and australasian plate boundaries and plate codes.

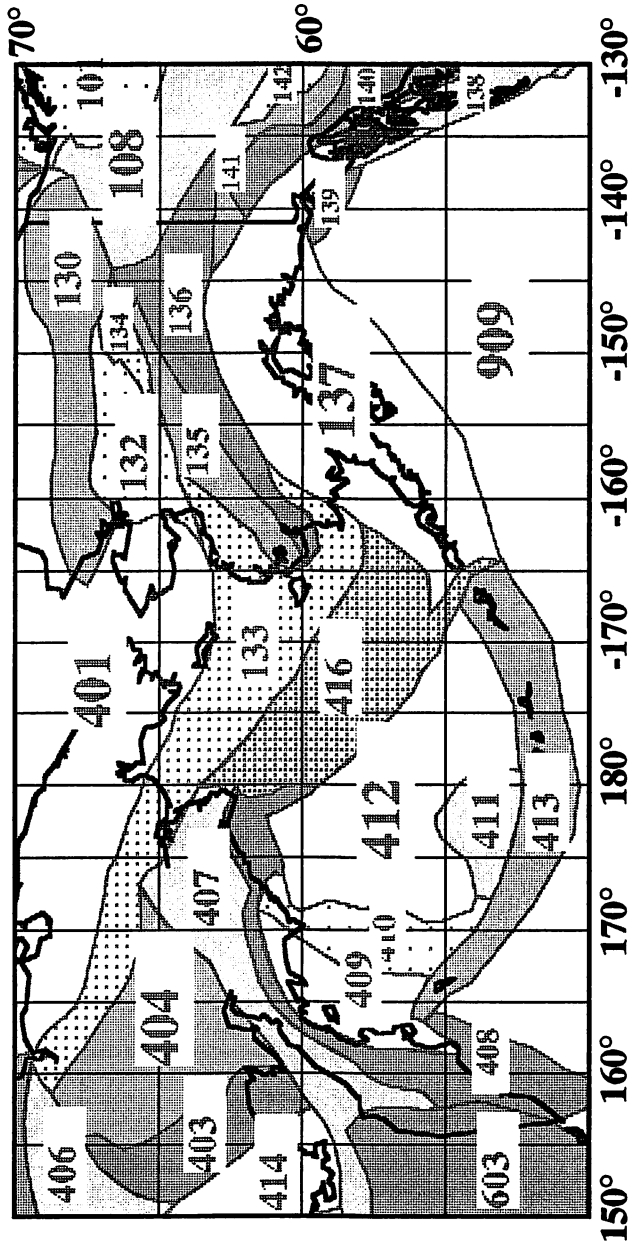


FIGURE A4.31. Map showing Bering Sea region plate boundaries and plate codes.

D6. Timescale Codes

Code	Period	Epoch	Stage	Substage	Abbreviation	Age Top
40000	Cenozoic				Cz, Cz	0.00
42000	Quaternary				Cz, Q, Q	0.00
42210				Early Holocene	Cz, Q, Hol1, eHol, eHol	0.00
42220				Middle Holocene	Cz, Q, Hol2, mHol, mHol	0.00
42230				Late Holocene	Cz, Q, Hol3, lHol, lHol	0.00
42200		Holocene			Cz, Q, Hol	0.00
42300		Present Day			Cz, Q, Pres	0.00
42400		Sub-Recent			Cz, Q, sR	0.00
42123				Late middle Pleistocene	Cz, Q, Ple, mPle, lmPle	0.01
42100					Cz, Q, Ple	0.01
42130			Late Pleistocene		Cz, Q, Ple3, lPle, lPle	0.01
42120			Middle Pleistocene		Cz, Q, Ple2, mPle, mPle	0.15
42122				Middle middle Pleistocene	Cz, Q, Ple, mPle, mmPle	0.15
42121				Early Middle Pleistocene	Cz, Q, Ple, mPle, emPle	0.59
42110			Early Pleistocene		Cz, Q, Ple1, ePle, ePle	0.76
41000	Tertiary				Cz, TT, TT	1.64
41500		Pliocene			Cz, TT, Pli	1.64
41520			Piacenzian		Cz, TT, Pli2, Pia, Pia	1.64
41523				Late Piacenzian	Cz, TT, Pli2, Pia3, lPia	1.64
41522				Middle Piacenzian	Cz, TT, Pli2, Pia2, mPia	*2.23
41521				Early Piacenzian	Cz, TT, Pli2, Pia1, ePia	*2.81
41510			Zanclean		Cz, TT, Pli1, Zan, Zan	3.40
41513				Late Zanclean	Cz, TT, Pli1, Zan3, lZan	3.40
41512				Middle Zanclean	Cz, TT, Pli1, Zan2, mZan	*4.00
41511				Early Zanclean	Cz, TT, Pli1, Zan1, eZan	*4.60
41400		Miocene			Cz, TT, Mio	5.20
41460			Messinian		Cz, TT, Mio3, Mes, Mes	5.20
41463				Late Messinian	Cz, TT, Mio3, Mes3, lMes	5.20
41462				Middle Messinian	Cz, TT, Mio3, Mes2, mMes	*5.70
41461				Early Messinian	Cz, TT, Mio3, Mes1, eMes	*6.20
41450			Tortonian		Cz, TT, Mio3, Tor, Tor	6.70
41453				Late Tortonian	Cz, TT, Mio3, Tor3, lTor	6.70
41452				Middle Tortonian	Cz, TT, Mio3, Tor2, mTor	*7.93
41451				Early Tortonian	Cz, TT, Mio3, Tor1, eTor	*9.17
41440			Seravallian		Cz, TT, Mio2, Ser, Ser	10.40
41443				Late Servallian	Cz, TT, Mio2, Ser3, lSer	10.40
41442				Middle Servallian	Cz, TT, Mio2, Ser2, mSer	*11.67
41441				Early Servallian	Cz, TT, Mio2, Ser1, eSer	*12.93
41430			Langhian		Cz, TT, Mio2, Lan, Lan	14.20
41433				Late Langhian	Cz, TT, Mio2, Lan3, lLan	14.20
41432				Middle Langhian	Cz, TT, Mio2, Lan2, mLan	*14.90
41431				Early Langhian	Cz, TT, Mio2, Lan1, eLan	*15.60
41420			Burdigalian		Cz, TT, Mio1, Bur, Bur	16.30
41423				Late Burdigalian	Cz, TT, Mio1, Bur3, lBur	16.30
41422				Middle Burdigalian	Cz, TT, Mio1, Bur2, mBur	*18.03
41421				Early Burdigalian	Cz, TT, Mio1, Bur1, eBur	*19.77
41410			Aquitanian		Cz, TT, Mio1, Aqu, Aqu	21.50
41413				Late Aquitanian	Cz, TT, Mio1, Aqu3, lAqu	21.50
41412				Middle Aquitanian	Cz, TT, Mio1, Aqu2, mAqu	*22.10
41411				Early Aquitanian	Cz, TT, Mio1, Aqu1, eAqu	*22.70
41300		Oligocene			Cz, TT, Oli	23.30
41320			Chattian		Cz, TT, Oli2, Cha, Cha	23.30

Code	Period	Epoch	Stage	Substage	Abbreviation	Age Top
41323				Late Chattian	Cz, TT, Oli2, Cha3, lCha	23.30
41322				Middle Chattian	Cz, TT, Oli2, Cha2, mCha	*25.30
41321				Early Chattian	Cz, TT, Oli2, Cha1, eCha	*27.30
41310			Rupelian		Cz, TT, Oli1, Rup, Rup	29.30
41313				Late Rupelian	Cz, TT, Oli1, Rup3, lRup	29.30
41312				Middle Rupelian	Cz, TT, Oli1, Rup2, mRup	*31.33
41311				Early Rupelian	Cz, TT, Oli1, Rup1, eRup	*33.37
41200		Eocene			Cz, TT, Eoc	35.40
41240			Priabonian		Cz, TT, Eoc3, Pri, Pri	35.40
41243				Late Priabonian	Cz, TT, Eoc3, Pri3, lPri	35.40
41242				Middle Priabonian	Cz, TT, Eoc3, Pri2, mPri	*36.47
41241				Early Priabonian	Cz, TT, Eoc3, Pri1, ePri	*37.53
41230			Bartonian		Cz, TT, Eoc2, Bar, Bar	38.60
41233				Late Bartonian	Cz, TT, Eoc2, Bar3, lBar	38.60
41232				Middle Bartonian	Cz, TT, Eoc2, Bar2, mBar	*39.77
41231				Early Bartonian	Cz, TT, Eoc2, Bar1, eBar	*40.93
41220			Lutetian		Cz, TT, Eoc2, Lut, Lut	42.10
41223				Late Lutetian	Cz, TT, Eoc2, Lut3, lLut	42.10
41222				Middle Lutetian	Cz, TT, Eoc2, Lut2, mLut	*44.73
41221				Early Lutetian	Cz, TT, Eoc2, Lut1, eLut	*47.37
41210			Ypresian		Cz, TT, Eoc1, Ypr, Ypr	50.00
41213				Late Ypresian	Cz, TT, Eoc1, Ypr3, lYpr	50.00
41212				Middle Ypresian	Cz, TT, Eoc1, Ypr2, mYpr	*52.17
41211				Early Ypresian	Cz, TT, Eoc1, Ypr1, eYpr	*54.33
41100		Paleocene			Cz, TT, Pal	56.50
41120			Thanetian		Cz, TT, Pal2, Tha, Tha	56.50
41123				Late Thanetian	Cz, TT, Pal2, Tha3, lTha	56.50
41122				Middle Thanetian	Cz, TT, Pal2, Tha2, mTha	*57.83
41121				Early Thanetian	Cz, TT, Pal2, Tha1, eTha	*59.17
41110			Danian		Cz, TT, Pal1, Dan, Dan	60.50
41113				Late Danian	Cz, TT, Pal1, Dan3, lDan	60.50
41112				Middle Danian	Cz, TT, Pal1, Dan2, mDan	*62.00
41111				Early Danian	Cz, TT, Pal1, Dan1, eDan	*63.50
30000	Mesozoic				Mz, Mz	65.00
33000	Cretaceous				Mz, K, K	65.00
33200		Late Cretaceous			Mz, K, K2	65.00
33260			Maestrichtian		Mz, K, K2, Mae, Mae	65.00
33263				Late Maestrichtian	Mz, K, K2, Mae3, lMae	65.00
33262				Middle Maestrichtian	Mz, K, K2, Mae2, mMae	*68.00
33261				Early Maestrichtian	Mz, K, K2, Mae1, eMae	*71.00
33250			Campanian		Mz, K, K2, Cam, Cam	74.00
33253				Late Campanian	Mz, K, K2, Cam3, lCam	74.00
33252				Middle Campanian	Mz, K, K2, Cam2, mCam	*77.00
33251				Early Campanian	Mz, K, K2, Cam1, eCam	*80.00
33240			Santonian		Mz, K, K2, San, San	83.00
33243				Late Santonian	Mz, K, K2, San3, lSan	83.00
33242				Middle Santonian	Mz, K, K2, San2, mSan	*84.20
33241				Early Santonian	Mz, K, K2, San1, eSan	*85.40
33230			Coniacian		Mz, K, K2, Con, Con	86.60
33233				Late Coniacian	Mz, K, K2, Con3, lCon	86.60
33232				Middle Coniacian	Mz, K, K2, Con2, mCon2	*87.23
33231				Early Coniacian	Mz, K, K2, Con1, eCon	*87.87
33220			Turonian		Mz, K, K2, Tur, Tur	88.50
33223				Late Turonian	Mz, K, K2, Tur3, lTur	88.50
33222				Middle Turonian	Mz, K, K2, Tur2, mTur	*89.13
33221				Early Turonian	Mz, K, K2, Tur1, eTur	*89.77

Code	Period	Epoch	Stage	Substage	Abbreviation	Age Top
33210			Cenomanian		Mz, K, K2, Cen, Cen	90.40
33213				Late Cenomanian	Mz, K, K2, Cen3, lCen	90.40
33212				Middle Cenomanian	Mz, K, K2, Cen2, mCen	*92.60
33211				Early Cenomanian	Mz, K, K2, Cen1, eCen	*94.80
33100		Early Cretaceous			Mz, K, K1	97.00
33160			Albian		Mz, K, K1, Alb, Alb	97.00
33163				Late Albian	Mz, K, K1, Alb3, lAlb	97.00
33162				Middle Albian	Mz, K, K1, Alb2, mAlb	*102.00
33161				Early Albian	Mz, K, K1, Alb1, eAlb	*107.00
33150			Aptian		Mz, K, K1, Apt, Apt	112.00
33153				Late Aptian	Mz, K, K1, Apt3, lApt	112.00
33152				Middle Aptian	Mz, K, K1, Apt2, mApt	*116.17
33151				Early Aptian	Mz, K, K1, Apt1, eApt	*120.33
33140			Barremian		Mz, K, K1, Bar, Bar	124.50
33143				Late Barremian	Mz, K, K1, Bar3, lBar	124.50
33142				Middle Barremian	Mz, K, K1, Bar2, mBar	*126.93
33141				Early Barremian	Mz, K, K1, Bar1, eBar	*129.37
33130			Hauterivian		Mz, K, K1, Hau, Hau	131.80
33133				Late Hauterivian	Mz, K, K1, Hau3, lHau	131.80
33132				Middle Hauterivian	Mz, K, K1, Hau2, mHau	*132.87
33131				Early Hauterivian	Mz, K, K1, Hau1, eHau	*133.93
33120			Valanginian		Mz, K, K1, Val, Val	135.00
33123				Late Valanginian	Mz, K, K1, Val3, lVal	135.00
33122				Middle Valanginian	Mz, K, K1, Val2, mVal	*136.90
33121				Early Valanginian	Mz, K, K1, Val1, eVal	*138.80
33110			Berriasian		Mz, K, K1, Ber, Ber	140.70
33113				Late Berriasian	Mz, K, K1, Ber3, lBer	140.70
33112				Middle Berriasian	Mz, K, K1, Ber2, mBer	*142.33
33111				Early Berriasian	Mz, K, K1, Ber1, eBer	*143.97
32000	Jurassic				Mz, J, J	145.60
32300		Late Jurassic			Mz, J, J3	145.60
32330			Tithonian		Mz, J, J3, Tit, Tit	145.60
32333				Late Tithonian	Mz, J, J3, Tit3, lTit	145.60
32332				Middle Tithonian	Mz, J, J3, Tit2, mTit	*147.77
32331				Early Tithonian	Mz, J, J3, Tit1, eTit	*149.93
32320			Kimmeridgian		Mz, J, J3, Kim, Kim	152.10
32323				Late Kimmeridgian	Mz, J, J3, Kim3, lKim	152.10
32322				Middle Kimmeridgian	Mz, J, J3, Kim2, mKim	*152.97
32321				Early Kimmeridgian	Mz, J, J3, Kim1, eKim	*153.83
32310			Oxfordian		Mz, J, J3, Oxf, Oxf	154.70
32313				Late Oxfordian	Mz, J, J3, Oxf3, lOxf	154.70
32312				Middle Oxfordian	Mz, J, J3, Oxf2, mOxf	*155.50
32311				Early Oxfordian	Mz, J, J3, Oxf1, eOxf	*156.30
32200		Middle Jurassic			Mz, J, J2	157.10
32240			Callovian		Mz, J, J2, Cal, Cal	157.10
32243				Late Callovian	Mz, J, J2, Cal3, lCal	157.10
32242				Middle Callovian	Mz, J, J2, Cal2, mCal	*158.50
32241				Early Callovian	Mz, J, J2, Cal1, eCal	*159.90
32230			Bathonian		Mz, J, J2, Bat, Bat	161.30
32233				Late Bathonian	Mz, J, J2, Bat3, lBat	161.30
32232				Middle Bathonian	Mz, J, J2, Bat2, mBat	*162.90
32231				Early Bathonian	Mz, J, J2, Bat1, eBat	*164.50
32220			Bajocian		Mz, J, J2, Baj, Baj	166.10
32223				Late Bajocian	Mz, J, J2, Baj3, lBaj	166.10
32222				Middle Bajocian	Mz, J, J2, Baj2, mBaj	*168.43
32221				Early Bajocian	Mz, J, J2, Baj1, eBaj	*170.77

Code	Period	Epoch	Stage	Substage	Abbreviation	Age Top
32210			Aalenian		Mz, J, J2, Aal, Aal	173.10
32213				Late Aalenian	Mz, J, J2, Aal3, lAal	173.10
32212				Middle Aalenian	Mz, J, J2, Aal2, mAal	*174.73
32211				Early Aalenian	Mz, J, J2, Aal1, eAal	*176.37
32100		Early Jurassic			Mz, J, J1	178.00
32140			Toarcian		Mz, J, J1, Toa, Toa	178.00
32143				Late Toarcian	Mz, J, J1, Toa3, lToa	178.00
32142				Middle Toarcian	Mz, J, J1, Toa2, mToa	*181.00
32141				Early Toarcian	Mz, J, J1, Toa1, eToa	*184.00
32130			Pliensbachian		Mz, J, J1, Pli, Pli	187.00
32133				Late Pliensbachian	Mz, J, J1, Pli3, lPli	187.00
32132				Middle Pliensbachian	Mz, J, J1, Pli2, mPli	*189.50
32131				Early Pliensbachian	Mz, J, J1, Pli1, ePli	*192.00
32120			Sinemurian		Mz, J, J1, Sin, Sin	194.50
32123				Late Sinemurian	Mz, J, J1, Sin3, lSin	194.50
32122				Middle Sinemurian	Mz, J, J1, Sin2, mSin	*197.50
32121				Early Sinemurian	Mz, J, J1, Sin1, eSin	*200.50
32110			Hettangian		Mz, J, J1, Het, Het	203.50
32113				Late Hettangian	Mz, J, J1, Het3, lHet	203.50
32112				Middle Hettangian	Mz, J, J1, Het2, mHet	*205.00
32111				Early Hettangian	Mz, J, J1, Het1, eHet	*206.50
31000	Triassic				Mz, Tr, Tr	208.00
31300		Late Triassic			Mz, Tr, Tr3	208.00
31330			Rhaetian		Mz, Tr, Tr3, Rha, Rha	208.00
31320			Norian		Mz, Tr, Tr3, Nor, Nor	209.50
31323				Late Norian	Mz, Tr, Tr3, Nor3, lNor	209.50
31322				Middle Norian	Mz, Tr, Tr3, Nor2, mNor	*214.13
31321				Early Norian	Mz, Tr, Tr3, Nor1, eNor	*218.77
31310			Carnian		Mz, Tr, Tr3, Car, Car	223.40
31313				Late Carnian	Mz, Tr, Tr3, Car3, lCar	223.40
31312				Middle Carnian	Mz, Tr, Tr3, Car2, mCar	*227.27
31311				Early Carnian	Mz, Tr, Tr3, Car1, eCar	*231.13
31200		Middle Triassic			Mz, Tr, Tr2	235.00
31220			Ladinian		Mz, Tr, Tr2, Lad, Lad	235.00
31223				Late Ladinian	Mz, Tr, Tr2, Lad3, lLad	235.00
31222				Middle Ladinian	Mz, Tr, Tr2, Lad2, mLad	*236.50
31221				Early Ladinian	Mz, Tr, Tr2, Lad1, eLad	*238.00
31210			Anisian		Mz, Tr, Tr2, Ani, Ani	239.50
31213				Late Anisian	Mz, Tr, Tr2, Ani3, lAni	239.50
31212				Middle Anisian	Mz, Tr, Tr2, Ani2, mAni	*240.03
31211				Early Anisian	Mz, Tr, Tr2, Ani1, eAni	*240.57
31100		Early Triassic			Mz, Tr, Tr1	241.10
31120			Olenkian		Mz, Tr, Tr1, Ole, Ole	241.10
31122				Spathian	Mz, Tr, Tr1, Ole2, Spa	241.10
31121				Smithian	Mz, Tr, Tr1, Ole1, Smi	*241.88
31110			Induan		Mz, Tr, Tr1, Ind, Ind	*242.65
31112				Dienerian	Mz, Tr, Tr1, Ind2, Die	*242.65
31111				Griesbachian	Mz, Tr, Tr1, Ind1, Gri	*243.83
20000	Paleozoic				Pz, Pz	245.00
26000	Permian				Pz, P, P	245.00
26200		Late Permian			Pz, P, P2	245.00
26230			Taturian		Pz, P, P2, Tat, Tat	245.00
26232				Changxingian	Pz, P, P2, Tat2, Chx	245.00
26231				Longtanian	Pz, P, P2, Tat1, Lgt	247.50
26220			Kazanian		Pz, P, P2, Kaz, Kaz	250.00
26222				Capitanian	Pz, P, P2, Kaz2, Cap	250.00

Code	Period	Epoch	Stage	Substage	Abbreviation	Age Top
26221				Wordian	Pz, P, P2, Kaz1, Wor	252.50
26210			Ufimian		Pz, P, P2, Ufi, Ufi	255.00
26100		Early Permian			Pz, P, P1	256.10
26140			Kungurian		Pz, P, P1, Kun, Kun	256.10
26130			Artinskian		Pz, P, P1, Art, Art	259.70
26120			Sakmarian		Pz, P, P1, Sak, Sak	268.80
26110			Asselian		Pz, P, P1, Ass, Ass	281.50
25000	Carboniferous				Pz, Car, Car	290.00
25200		Late Carboniferous			Pz, Car, C2	290.00
25240			Gzelian		Pz, Car, C2, Gze, Gze	290.00
25242				Noginskian	Pz, Car, C2, Gze2, Nog	290.00
25241				Klaminskian	Pz, Car, C2, Gze1, Kla	293.60
25230			Kasimovian		Pz, Car, C2, Kas, Kas	295.10
25233				Dorogomilovskian	Pz, Car, C2, Kas3, Dor	295.10
25232				Chamovnicheskian	Pz, Car, C2, Kas2, Chv	298.30
25231				Krevyakinskian	Pz, Car, C2, Kas1, Krv	299.90
25220			Moscovian		Pz, Car, C2, Mos, Mos	303.00
25224				Myachkovskian	Pz, Car, C2, Mos4, Mya	303.00
25223				Podoiskian	Pz, Car, C2, Mos3, Pod	305.00
25222				Kashirskian	Pz, Car, C2, Mos2, Ksk	307.10
25221				Vereiskian	Pz, Car, C2, Mos1, Vrk	309.20
25210			Bashkirian		Pz, Car, C2, Bsh, Bsh	311.30
25215				Melekesskian	Pz, Car, C2, Bsh5, Mel	311.30
25214				Cheremskanskian	Pz, Car, C2, Bsh4, Che	313.40
25213				Yeadonian	Pz, Car, C2, Bsh3, Yea	318.30
25212				Marshdenian	Pz, Car, C2, Bsh2, Mrd	320.60
25211				Kinderscoutian	Pz, Car, C2, Bsh1, Kin	321.50
25100		Early Carboniferous			Pz, Car, C1	322.80
25130			Serpukhovian		Pz, Car, C1, Spk, Spk	322.80
25134				Alportian	Pz, Car, C1, Spk4, Alp	322.80
25133				Chokierian	Pz, Car, C1, Spk3, Cho	325.60
25132				Arnbergian	Pz, Car, C1, Spk2, Arn	328.30
25131				Pendleian	Pz, Car, C1, Spk1, Pnd	331.10
25120			Visean		Pz, Car, C1, Vis, Vis	332.90
25125				Brigantian	Pz, Car, C1, Vis5, Bri	332.90
25124				Asbian	Pz, Car, C1, Vis4, Asb	336.00
25123				Holkerian	Pz, Car, C1, Vis3, Hlk	339.40
25122				Arundian	Pz, Car, C1, Vis2, Aru	342.80
25121				Chadian	Pz, Car, C1, Vis1, Chd	345.00
25110			Tournaisian		Pz, Car, C1, Tou, Tou	349.50
25112				Ivorian	Pz, Car, C1, Tou2, Ivo	349.50
25111				Hastarian	Pz, Car, C1, Tou1, Has	353.80
24000	Devonian				Pz, D, D	362.50
24300		Late Devonian			Pz, D, D3	362.50
24320			Fammenian		Pz, D, D3, Fam, Fam	362.50
24310			Frasnian		Pz, D, D3, Fra, Fra	367.40
24200		Middle Devonian			Pz, D, D2	377.40
24220			Givetian		Pz, D, D2, Giv, Giv	377.40
24210			Eifelian		Pz, D, D2, Eif, Eif	380.80
24100		Early Devonian			Pz, D, D1	386.00
24130			Emsian		Pz, D, D1, Ems, Ems	386.00
24120			Siegenian		Pz, D, D1, Sie, Sie	390.40
24110			Gedinnian		Pz, D, D1, Ged, Ged	396.30
23000	Silurian				Pz, S, S	408.50
23200		Late Silurian			Pz, S, S2	408.50
23220			Pridolian		Pz, S, S2, Prd, Prd	408.50

Code	Period	Epoch	Stage	Substage	Abbreviation	Age Top
23210			Ludlovian		Pz, S, S2, Lud, Lud	410.70
23212				Ludfordian	Pz, S, S2, Lud2, Ldf	410.70
23211				Gorstian	Pz, S, S2, Lud1, Gor	415.10
23100		Early Silurian			Pz, S, S1	424.00
23120			Wenlockian		Pz, S, S1, Wen, Wen	424.00
23123				Gleedonian	Pz, S, S1, Wen3, Gle	424.00
23122				Whitwellian	Pz, S, S1, Wen2, Whi	425.40
23121				Sheinwoodian	Pz, S, S1, Wen1, She	426.10
23110			Llandoverian		Pz, S, S1, Lly, Lly	430.40
23113				Telychian	Pz, S, S1, Lly3, Tel	430.40
23112				Aeronian	Pz, S, S1, Lly2, Aer	432.60
23111				Rhuddanian	Pz, S, S1, Lly1, Rhu	436.90
22000	Ordovician				Pz, O, O	439.00
22300		Late Ordovician			Pz, O, O3	439.00
22320			Ashgillian		Pz, O, O3, Ash, Ash	439.00
22324				Hirnantian	Pz, O, O3, Ash4, Hir	439.00
22323				Rawtheyan	Pz, O, O3, Ash3, Raw	439.50
22322				Cautleyan	Pz, O, O3, Ash2, Cau	440.10
22321				Pusgillian	Pz, O, O3, Ash1, Pus	440.60
22310			Carodocian		Pz, O, O3, Crd, Crd	443.10
22317				Onnian	Pz, O, O3, Crd7, Onn	443.10
22316				Actonian	Pz, O, O3, Crd6, Act	444.00
22315				Marshbrookian	Pz, O, O3, Crd5, Mrb	444.50
22314				Longvillian	Pz, O, O3, Crd4, Lon	447.10
22313				Soudleyan	Pz, O, O3, Crd3, Sou	449.70
22312				Harnagian	Pz, O, O3, Crd2, Har	457.50
22311				Costonian	Pz, O, O3, Crd1, Cos	462.30
22200		Middle Ordovician			Pz, O, O2	463.90
22220			Llandeilan		Pz, O, O2, Llo, Llo	463.90
22223				Late Llandeilan	Pz, O, O2, Llo3, lLlo	463.90
22222				Middle Llandeilan	Pz, O, O2, Llo2, mLlo	465.40
22221				Early Llandeilan	Pz, O, O2, Llo1, eLlo	467.00
22210			Llanvirnian		Pz, O, Ord2, Lln, Lln	468.60
22212				Late Llanvirnian	Pz, O, Ord2, Lln2, lLln	468.60
22211				Early Llanvirnian	Pz, O, Ord2, Lln1, eLln	472.70
22100		Early Ordovician			Pz, O, O1	476.10
22120			Arenigian		Pz, O, O1, Are, Are	476.10
22110			Tremadocian		Pz, O, O1, Tre, Tre	493.00
21000	Cambrian				Pz, Cam, Cam	510.00
21300		Late Cambrian			Pz, Cam, Cam3	510.00
21320			Dolgellian		Pz, Cam, Cam3, Dol, Dol	510.00
21310			Maentwrogian		Pz, Cam, Cam3, Mnt, Mnt	514.10
21200		Middle Cambrian			Pz, Cam, Cam2	517.20
21220			Menevian		Pz, Cam, Cam2, Men, Men	517.20
21210			Solvan		Pz, Cam, Cam2, Sol, Sol	530.20
21100		Early Cambrian			Pz, Cam, Cam1	536.00
21130			Lenian		Pz, Cam, Cam1, Len, Len	536.00
21120			Atdabanian		Pz, Cam, Cam1, Atb, Atb	554.00
21110			Tommotian		Pz, Cam, Cam1, Tom, Tom	560.00
10000	Proterozoic				Pro, Pro	570.00
14000	Sinian				Pro3, Z, Z	570.00
14200		Vendian			Pro3, Z2, V	570.00
14220			Ediacara		Pro3, Z2, V2, Edi, Edi	570.00
14210			Varanger		Pro3, Z2, V1, Var, Var	590.00
14100		Sturtian			Pro3, Z1, Stu	610.00
13000	Riphean				Pro2, Rif, Rif	800.00

Code	Period	Epoch	Stage	Substage	Abbreviation	Age Top
13300		Karatau			Pro2, Rif3, Kar	800.00
13200		Yurmatin			Pro2, Rif2, Yur	1050.00
13100		Burzyan			Pro2, Rif1, Buz	1350.00
12000	Animikean				Pro1, Ani, Ani	1650.00
11000	Huronian				Pro1, Hur, Hur	2200.00
0	Archean				Arc, Arc	2450.00
3000	Late Archean				Arc, Arc3, Arc3	2450.00
2200	Middle Archean				Arc, Arc2, Arc2	*3000.00
1000	Early Archean				Arc, Arc1, Arc1	*3500.00

D7. Timescale Ages

Code	Abbreviation	DNAG'83 Top	DNAG'83 Bottom	Harland'89 Top	Harland'89 Bottom
40000	Cz, Cz	0.00	66.40	0.00	65.00
42000	Cz, Q, Q	0.00	1.60	0.00	1.64
42210	Cz, Q, Hol1, eHol, eHol	0.00	0.01	0.00	0.01
42220	Cz, Q, Hol2, mHol, mHol	0.00	0.01	0.00	0.01
42230	Cz, Q, Hol3, lHol, lHol	0.00	0.01	0.00	0.01
42200	Cz, Q, Hol	0.00	0.01	0.00	0.01
42300	Cz, Q, Pres	0.00	0.00	0.00	0.00
42400	Cz, Q, sR	0.00	0.00	0.00	0.00
42123	Cz, Q, Ple, mPle, lmPle	0.01	*0.15	0.01	0.15
42100	Cz, Q, Ple	0.01	1.60	0.01	1.64
42130	Cz, Q, Ple3, lPle, lPle	0.01	*0.15	0.01	0.15
42120	Cz, Q, Ple2, mPle, mPle	*0.15	*0.76	0.15	0.76
42122	Cz, Q, Ple, mPle, mmPle	*0.15	*0.76	0.15	0.76
42120	Cz, Q, Ple, mPle, mPle	0.15	0.76	0.15	0.76
42121	Cz, Q, Ple, mPle, emPle	*0.59	*0.76	0.59	0.76
42110	Cz, Q, Ple1, ePle, ePle	*0.76	1.64	0.76	1.64
41000	Cz, TT, TT	1.60	66.40	1.64	65.00
41500	Cz, TT, Pli	1.60	5.30	1.64	5.20
41520	Cz, TT, Pli2, Pia, Pia	1.60	3.40	1.64	3.40
41523	Cz, TT, Pli2, Pia3, lPia	1.60	*2.20	1.64	*2.23
41522	Cz, TT, Pli2, Pia2, mPia	*2.20	*2.80	*2.23	*2.81
41521	Cz, TT, Pli2, Pia1, ePia	*2.80	3.40	*2.81	3.40
41510	Cz, TT, Pli1, Zan, Zan	3.40	5.30	3.40	5.20
41513	Cz, TT, Pli1, Zan3, lZan	3.40	*4.03	3.40	*4.00
41512	Cz, TT, Pli1, Zan2, mZan	*4.03	*4.67	*4.00	*4.60
41511	Cz, TT, Pli1, Zan1, eZan	*4.67	5.30	*4.60	5.20
41400	Cz, TT, Mio	5.30	23.70	5.20	23.30
41460	Cz, TT, Mio3, Mes, Mes	5.30	6.50	5.20	6.70
41463	Cz, TT, Mio3, Mes3, lMes	5.30	*5.70	5.20	*5.70
41462	Cz, TT, Mio3, Mes2, mMes	*5.70	*6.10	*5.70	*6.20
41461	Cz, TT, Mio3, Mes1, eMes	*6.10	6.50	*6.20	6.70
41450	Cz, TT, Mio3, Tor, Tor	6.50	11.20	6.70	10.40
41453	Cz, TT, Mio3, Tor3, lTor	6.50	*8.07	6.70	*7.93
41452	Cz, TT, Mio3, Tor2, mTor	*8.07	*9.63	*7.93	*9.17
41451	Cz, TT, Mio3, Tor1, eTor	*9.63	11.20	*9.17	10.40
41440	Cz, TT, Mio2, Ser, Ser	11.20	15.10	10.40	14.20
41443	Cz, TT, Mio2, Ser3, lSer	11.20	*12.50	10.40	*11.67
41442	Cz, TT, Mio2, Ser2, mSer	*12.50	*13.80	*11.67	*12.93
41441	Cz, TT, Mio2, Ser1, eSer	*13.80	15.10	*12.93	14.20
41430	Cz, TT, Mio2, Lan, Lan	15.10	16.60	14.20	16.30
41433	Cz, TT, Mio2, Lan3, lLan	15.10	*15.60	14.20	*14.90
41432	Cz, TT, Mio2, Lan2, mLan	*15.60	*16.10	*14.90	*15.60
41431	Cz, TT, Mio2, Lan1, eLan	*16.10	16.60	*15.60	16.30
41420	Cz, TT, Mio1, Bur, Bur	16.60	21.80	16.30	21.50
41423	Cz, TT, Mio1, Bur3, lBur	16.60	*18.33	16.30	*18.03
41422	Cz, TT, Mio1, Bur2, mBur	*18.33	*20.07	*18.03	*19.77

Code	Abbreviation	DNAG'83 Top	DNAG'83 Bottom	Harland'89 Top	Harland'89 Bottom
41421	Cz, TT, Mio1, Bur1, eBur	*20.07	21.80	*19.77	21.50
41410	Cz, TT, Mio1, Aqu, Aqu	21.80	23.70	21.50	23.30
41413	Cz, TT, Mio1, Aqu3, lAqu	21.80	*22.43	21.50	*22.10
41412	Cz, TT, Mio1, Aqu2, mAqu	*22.43	*23.07	*22.10	*22.70
41411	Cz, TT, Mio1, Aqu1, eAqu	*23.07	23.70	*22.70	23.30
41300	Cz, TT, Oli	23.70	36.60	23.30	35.40
41320	Cz, TT, Oli2, Cha, Cha	23.70	30.00	23.30	29.30
41323	Cz, TT, Oli2, Cha3, lCha	23.70	*25.80	23.30	*25.30
41322	Cz, TT, Oli2, Cha2, mCha	*25.80	*27.90	*25.30	*27.30
41321	Cz, TT, Oli2, Cha1, eCha	*27.90	30.00	*27.30	29.30
41310	Cz, TT, Oli1, Rup, Rup	30.00	36.60	29.30	35.40
41313	Cz, TT, Oli1, Rup3, lRup	30.00	*32.20	29.30	*31.33
41312	Cz, TT, Oli1, Rup2, mRup	*32.20	*34.40	*31.33	*33.37
41311	Cz, TT, Oli1, Rup1, eRup	*34.40	36.60	*33.37	35.40
41200	Cz, TT, Eoc	36.60	57.80	35.40	56.50
41240	Cz, TT, Eoc3, Pri, Pri	36.60	40.00	35.40	38.60
41243	Cz, TT, Eoc3, Pri3, lPri	36.60	*37.73	35.40	*36.47
41242	Cz, TT, Eoc3, Pri2, mPri	*37.73	*38.87	*36.47	*37.53
41241	Cz, TT, Eoc3, Pri1, ePri	*38.87	40.00	*37.53	38.60
41230	Cz, TT, Eoc2, Bar, Bar	40.00	43.60	38.60	42.10
41233	Cz, TT, Eoc2, Bar3, lBar	40.00	*41.20	38.60	*39.77
41232	Cz, TT, Eoc2, Bar2, mBar	*41.20	*42.40	*39.77	*40.93
41231	Cz, TT, Eoc2, Bar1, eBar	*42.40	43.60	*40.93	42.10
41220	Cz, TT, Eoc2, Lut, Lut	43.60	52.00	42.10	50.00
41223	Cz, TT, Eoc2, Lut3, lLut	43.60	*46.40	42.10	*44.73
41222	Cz, TT, Eoc2, Lut2, mLut	*46.40	*49.20	*44.73	*47.37
41221	Cz, TT, Eoc2, Lut1, eLut	*49.20	52.00	*47.37	50.00
41210	Cz, TT, Eoc1, Ypr, Ypr	52.00	57.80	50.00	56.50
41213	Cz, TT, Eoc1, Ypr3, lYpr	52.00	*53.93	50.00	*52.17
41212	Cz, TT, Eoc1, Ypr2, mYpr	*53.93	*55.87	*52.17	*54.33
41211	Cz, TT, Eoc1, Ypr1, eYpr	*55.87	57.80	*54.33	56.50
41100	Cz, TT, Pal	57.80	66.40	56.50	65.00
41120	Cz, TT, Pal2, Tha, Tha	57.80	63.60	56.50	60.50
41123	Cz, TT, Pal2, Tha3, lTha	57.80	*59.73	56.50	*57.83
41122	Cz, TT, Pal2, Tha2, mTha	*59.73	*63.60	*57.83	*59.17
41121	Cz, TT, Pal2, Tha1, eTha	*61.67	63.60	*59.17	60.50
41110	Cz, TT, Pal1, Dan, Dan	63.60	66.40	60.50	65.00
41113	Cz, TT, Pal1, Dan3, lDan	63.60	*64.53	60.50	*62.00
41112	Cz, TT, Pal1, Dan2, mDan	*64.53	*65.47	*62.00	*63.50
41111	Cz, TT, Pal1, Dan1, eDan	*65.47	66.40	*63.50	65.00
30000	Mz, Mz	66.40	245.00	65.00	245.00
33000	Mz, K, K	66.40	144.00	65.00	145.60
33200	Mz, K, K2	66.40	97.50	65.00	97.00
33260	Mz, K, K2, Mae, Mae	66.40	74.50	65.00	74.00
33263	Mz, K, K2, Mae3, lMae	66.40	*69.10	65.00	*68.00
33262	Mz, K, K2, Mae2, mMae	*69.10	*71.80	*68.00	*71.00
33261	Mz, K, K2, Mae1, eMae	*71.80	74.50	*71.00	74.00
33250	Mz, K, K2, Cam, Cam	74.50	84.00	74.00	83.00
33253	Mz, K, K2, Cam3, lCam	74.50	*77.67	74.00	*77.00
33252	Mz, K, K2, Cam2, mCam	*77.67	*80.83	*77.00	*80.00

Code	Abbreviation	DNAG'83 Top	DNAG'83 Bottom	Harland'89 Top	Harland'89 Bottom
33251	Mz, K, K2, Cam1, eCam	*80.83	84.00	*80.00	83.00
33240	Mz, K, K2, San, San	84.00	87.50	83.00	86.60
33243	Mz, K, K2, San3, lSan	84.00	*85.17	83.00	*84.20
33242	Mz, K, K2, San2, mSan	*85.17	*86.33	*84.20	*85.40
33241	Mz, K, K2, San1, eSan	*86.33	87.50	*85.40	86.60
33230	Mz, K, K2, Con, Con	87.50	88.50	86.60	88.50
33233	Mz, K, K2, Con3, lCon	87.50	*87.83	86.60	*87.23
33232	Mz, K, K2, Con2, mCon2	*87.83	*88.17	*87.23	*88.87
33231	Mz, K, K2, Con1, eCon	*88.17	88.50	*87.87	88.50
33220	Mz, K, K2, Tur, Tur	88.50	91.00	88.50	90.40
33223	Mz, K, K2, Tur3, lTur	88.50	*89.33	88.50	*89.13
33222	Mz, K, K2, Tur2, mTur	*89.33	*90.17	*89.13	*89.77
33221	Mz, K, K2, Tur1, eTur	*90.17	91.00	*89.77	90.40
33210	Mz, K, K2, Cen, Cen	91.00	97.50	90.40	97.00
33213	Mz, K, K2, Cen3, lCen	91.00	*93.17	90.40	*92.60
33212	Mz, K, K2, Cen2, mCen	*93.17	*95.33	*92.60	*94.80
33211	Mz, K, K2, Cen1, eCen	*95.33	97.50	*94.80	97.00
33100	Mz, K, K1	97.50	144.00	97.00	145.60
33160	Mz, K, K1, Alb, Alb	97.50	113.00	97.00	112.00
33163	Mz, K, K1, Alb3, lAlb	97.50	*102.67	97.00	*102.00
33162	Mz, K, K1, Alb2, mAlb	*102.67	*107.83	*102.00	*107.00
33161	Mz, K, K1, Alb1, eAlb	*107.83	113.00	*107.00	112.00
33150	Mz, K, K1, Apt, Apt	113.00	119.00	112.00	124.50
33153	Mz, K, K1, Apt3, lApt	113.00	*115.00	112.00	*116.17
33152	Mz, K, K1, Apt2, mApt	*115.00	*117.00	*116.17	*120.33
33151	Mz, K, K1, Apt1, eApt	*117.00	119.00	*120.33	124.50
33140	Mz, K, K1, Bar, Bar	119.00	124.00	124.50	131.80
33143	Mz, K, K1, Bar3, lBar	119.00	*120.67	124.50	*126.93
33142	Mz, K, K1, Bar2, mBar	*120.67	*122.89	*126.93	*129.37
33141	Mz, K, K1, Bar1, eBar	*122.33	124.00	*129.37	131.80
33130	Mz, K, K1, Hau, Hau	124.00	131.00	131.80	135.00
33133	Mz, K, K1, Hau3, lHau	124.00	*126.33	131.80	*132.87
33132	Mz, K, K1, Hau2, mHau	*126.33	*128.67	*132.87	*133.93
33131	Mz, K, K1, Hau1, eHau	*128.67	131.00	*133.93	135.00
33120	Mz, K, K1, Val, Val	131.00	138.00	135.00	140.70
33123	Mz, K, K1, Val3, lVal	131.00	*133.33	135.00	*136.90
33122	Mz, K, K1, Val2, mVal	*133.33	*135.67	*136.90	*138.80
33121	Mz, K, K1, Val1, eVal	*135.67	138.00	*138.80	140.70
33110	Mz, K, K1, Ber, Ber	138.00	144.00	140.70	145.60
33113	Mz, K, K1, Ber3, lBer	138.00	*140.00	140.70	*142.33
33112	Mz, K, K1, Ber2, mBer	*140.00	*142.00	*142.33	*143.97
33111	Mz, K, K1, Ber1, eBer	*142.00	144.00	*143.97	145.60
32000	Mz, J, J	144.00	208.00	145.60	208.00
32330	Mz, J, J3, Tit, Tit	144.00	152.00	145.60	152.10
32333	Mz, J, J3, Tit3, lTit	144.00	*146.67	145.60	*147.77
32332	Mz, J, J3, Tit2, mTit	*146.67	*149.33	*147.77	*149.93
32331	Mz, J, J3, Tit1, eTit	*149.33	152.00	*149.93	152.10
32320	Mz, J, J3, Kim, Kim	152.00	156.00	152.10	154.70
32323	Mz, J, J3, Kim3, lKim	152.00	*153.33	152.10	*152.97
32322	Mz, J, J3, Kim2, mKim	*153.33	*154.67	*152.97	*153.83

Code	Abbreviation	DNAG'83 Top	DNAG'83 Bottom	Harland'89 Top	Harland'89 Bottom
32321	Mz, J, J3, Kim1, eKim	*154.67	156.00	*153.83	154.70
32300	Mz, J, J3	156.00	163.00	145.60	157.10
32310	Mz, J, J3, Oxf, Oxf	156.00	163.00	154.70	157.10
32313	Mz, J, J3, Oxf3, lOxf	156.00	*158.33	154.70	*155.50
32312	Mz, J, J3, Oxf2, mOxf	*158.33	*160.67	*155.50	*156.30
32311	Mz, J, J3, Oxf1, eOxf	*160.67	163.00	*156.30	157.10
32200	Mz, J, J2	163.00	187.00	157.10	178.00
32240	Mz, J, J2, Cal, Cal	163.00	169.00	157.10	161.30
32243	Mz, J, J2, Cal3, lCal	163.00	*165.00	157.10	*158.50
32242	Mz, J, J2, Cal2, mCal	*165.00	*167.00	*158.50	*159.90
32241	Mz, J, J2, Cal1, eCal	*167.00	169.00	*159.90	161.30
32230	Mz, J, J2, Bat, Bat	169.00	176.00	161.30	166.10
32233	Mz, J, J2, Bat3, lBat	169.00	*171.33	161.30	*162.90
32232	Mz, J, J2, Bat2, mBat	*171.33	*173.67	*162.90	*164.50
32231	Mz, J, J2, Bat1, eBat	*173.67	176.00	*164.50	166.10
32220	Mz, J, J2, Baj, Baj	176.00	183.00	166.10	173.10
32223	Mz, J, J2, Baj3, lBaj	176.00	*178.33	166.10	*168.43
32222	Mz, J, J2, Baj2, mBaj	*178.33	*180.67	*168.43	*170.77
32221	Mz, J, J2, Baj1, eBaj	*180.67	183.00	*170.77	173.10
32210	Mz, J, J2, Aal, Aal	183.00	187.00	173.10	178.00
32213	Mz, J, J2, Aal3, lAal	183.00	*184.33	173.10	*174.73
32212	Mz, J, J2, Aal2, mAal	*184.33	*185.67	*174.73	*176.37
32211	Mz, J, J2, Aal1, eAal	*185.67	187.00	*176.37	178.00
32100	Mz, J, J1	187.00	208.00	178.00	208.00
32140	Mz, J, J1, Toa, Toa	187.00	193.00	178.00	187.00
32143	Mz, J, J1, Toa3, lToa	187.00	*189.00	178.00	*181.00
32142	Mz, J, J1, Toa2, mToa	*189.00	*191.00	*181.00	*184.00
32141	Mz, J, J1, Toa1, eToa	*191.00	193.00	*184.00	187.00
32130	Mz, J, J1, Pli, Pli	193.00	198.00	187.00	194.50
32133	Mz, J, J1, Pli3, lPli	193.00	*194.67	187.00	*189.50
32132	Mz, J, J1, Pli2, mPli	*194.67	*196.33	*189.50	*192.00
32131	Mz, J, J1, Pli1, ePli	*196.33	198.00	*192.00	194.50
32120	Mz, J, J1, Sin, Sin	198.00	204.00	194.50	203.50
32123	Mz, J, J1, Sin3, lSin	198.00	*200.00	194.50	*197.50
32122	Mz, J, J1, Sin2, mSin	*200.00	*202.00	*197.50	*200.50
32121	Mz, J, J1, Sin1, eSin	*202.00	204.00	*200.50	203.50
32110	Mz, J, J1, Het, Het	204.00	208.00	203.50	208.00
32113	Mz, J, J1, Het3, lHet	204.00	*205.33	203.50	*205.00
32112	Mz, J, J1, Het2, mHet	*205.33	*206.67	*205.00	*206.50
32111	Mz, J, J1, Het1, eHet	*206.67	208.00	*206.50	208.00
31000	Mz, Tr, Tr	208.00	245.00	208.00	245.00
31300	Mz, Tr, Tr3	208.00	230.00	208.00	235.00
31320	Mz, Tr, Tr3, Nor, Nor	208.00	225.00	209.50	223.40
31323	Mz, Tr, Tr3, Nor3, lNor	208.00	*213.67	209.50	*214.13
31330	Mz, Tr, Tr3, Rha, Rha	208.00	208.00	208.00	209.50
31322	Mz, Tr, Tr3, Nor2, mNor	*213.67	*219.33	*214.13	*218.77
31321	Mz, Tr, Tr3, Nor1, eNor	*219.33	225.00	*218.77	223.40
31310	Mz, Tr, Tr3, Car, Car	225.00	230.00	223.40	235.00
31313	Mz, Tr, Tr3, Car3, lCar	225.00	*226.67	223.40	*227.27
31312	Mz, Tr, Tr3, Car2, mCar	*226.67	*228.33	*227.27	*231.13

Code	Abbreviation	DNAG'83 Top	DNAG'83 Bottom	Harland'89 Top	Harland'89 Bottom
31311	Mz, Tr, Tr3, Car1, eCar	*228.33	230.00	*231.13	235.00
31200	Mz, Tr, Tr2	230.00	240.00	235.00	241.10
31220	Mz, Tr, Tr2, Lad, Lad	230.00	235.00	235.00	239.50
31223	Mz, Tr, Tr2, Lad3, lLad	230.00	*231.67	235.00	*236.50
31222	Mz, Tr, Tr2, Lad2, mLad	*231.67	*233.33	*236.50	*238.00
31221	Mz, Tr, Tr2, Lad1, eLad	*233.33	235.00	*238.00	239.50
31210	Mz, Tr, Tr2, Ani, Ani	235.00	240.00	239.50	241.10
31213	Mz, Tr, Tr2, Ani3, lAni	235.00	*236.67	239.50	*240.03
31212	Mz, Tr, Tr2, Ani2, mAni	*236.67	*238.33	*240.03	*240.57
31211	Mz, Tr, Tr2, Ani1, eAni	*238.33	240.00	*240.57	241.10
31100	Mz, Tr, Tr1	240.00	245.00	241.10	245.00
31120	Mz, Tr, Tr1, Ole, Ole	240.00	*242.50	241.10	*242.65
31122	Mz, Tr, Tr1, Ole2, Spa	240.00	*241.25	241.10	*241.88
31121	Mz, Tr, Tr1, Ole1, Smi	*241.25	*242.50	*241.88	*242.65
31110	Mz, Tr, Tr1, Ind, Ind	*242.50	245.00	*242.65	245.00
31112	Mz, Tr, Tr1, Ind2, Die	*242.50	*243.75	*242.65	*243.83
31111	Mz, Tr, Tr1, Ind1, Gri	*243.75	245.00	*243.83	245.00
20000	Pz, Pz	245.00	570.00	245.00	570.00
26000	Pz, P, P	245.00	286.00	245.00	290.00
26200	Pz, P, P2	245.00	258.00	245.00	256.10
26230	Pz, P, P2, Tat, Tat	245.00	253.00	245.00	250.00
26232	Pz, P, P2, Tat2, Chx	245.00	*249.00	245.00	247.50
26231	Pz, P, P2, Tat1, Lgt	*249.00	253.00	247.50	250.00
26220	Pz, P, P2, Kaz, Kaz	253.00	*255.50	250.00	255.00
26222	Pz, P, P2, Kaz2, Cap	253.00	*254.25	250.00	252.50
26221	Pz, P, P2, Kaz1, Wor	*254.25	*255.50	252.50	255.00
26210	Pz, P, P2, Ufi, Ufi	*255.50	258.00	255.00	256.10
26100	Pz, P, P1	258.00	286.00	256.10	290.00
26140	Pz, P, P1, Kun, Kun	258.00	263.00	256.10	259.70
26130	Pz, P, P1, Art, Art	263.00	268.00	259.70	268.80
26120	Pz, P, P1, Sak, Sak	268.00	*277.00	268.80	281.50
26110	Pz, P, P1, Ass, Ass	*277.00	286.00	281.50	290.00
25000	Pz, Car, Car	286.00	360.00	290.00	362.50
25200	Pz, Car, C2	286.00	320.00	290.00	322.80
25240	Pz, Car, C2, Gze, Gze	286.00	*291.00	290.00	295.10
25242	Pz, Car, C2, Gze2, Nog	286.00	*288.50	290.00	293.60
25241	Pz, Car, C2, Gze1, Kla	*288.50	*291.00	293.60	295.10
25230	Pz, Car, C2, Kas, Kas	*291.00	296.00	295.10	303.00
25233	Pz, Car, C2, Kas3, Dor	*291.00	*292.67	295.10	298.30
25232	Pz, Car, C2, Kas2, Chv	*292.67	*294.33	298.30	299.90
25231	Pz, Car, C2, Kas1, Krv	*294.33	296.00	299.90	303.00
25220	Pz, Car, C2, Mos, Mos	296.00	308.00	303.00	311.30
25224	Pz, Car, C2, Mos4, Mya	296.00	*299.00	303.00	305.00
25223	Pz, Car, C2, Mos3, Pod	*299.00	*302.00	305.00	307.10
25222	Pz, Car, C2, Mos2, Ksk	*302.00	*305.00	307.10	309.20
25221	Pz, Car, C2, Mos1, Vrk	*305.00	308.00	309.20	311.30
25210	Pz, Car, C2, Bsh, Bsh	308.00	320.00	311.30	322.80
25215	Pz, Car, C2, Bsh5, Mel	308.00	*310.40	311.30	313.40
25214	Pz, Car, C2, Bsh4, Che	*310.40	*312.80	313.40	318.30
25213	Pz, Car, C2, Bsh3, Yea	*312.80	*315.20	318.30	320.60

Code	Abbreviation	DNAG'83 Top	DNAG'83 Bottom	Harland'89 Top	Harland'89 Bottom
25212	Pz, Car, C2, Bsh2, Mrd	*315.20	*317.60	320.60	321.50
25211	Pz, Car, C2, Bsh1, Kin	*317.60	320.00	321.50	322.80
25100	Pz, Car, C1	320.00	360.00	322.80	362.50
25130	Pz, Car, C1, Spk, Spk	320.00	333.00	322.80	332.90
25134	Pz, Car, C1, Spk4, Alp	320.00	*323.25	322.80	325.60
25133	Pz, Car, C1, Spk3, Cho	*323.25	*326.50	325.60	328.30
25132	Pz, Car, C1, Spk2, Arn	*326.50	*329.75	328.30	331.10
25131	Pz, Car, C1, Spk1, Pnd	*329.75	333.00	331.10	332.90
25120	Pz, Car, C1, Vis, Vis	333.00	352.00	332.90	349.50
25125	Pz, Car, C1, Vis5, Bri	333.00	*336.80	332.90	336.00
25124	Pz, Car, C1, Vis4, Asb	*336.80	*340.60	336.00	339.40
25123	Pz, Car, C1, Vis3, Hlk	*340.60	*344.40	339.40	342.80
25122	Pz, Car, C1, Vis2, Aru	*344.40	*348.20	342.80	345.00
25121	Pz, Car, C1, Vis1, Chd	348.20	352.00	345.00	349.50
25110	Pz, Car, C1, Tou, Tou	352.00	360.00	349.50	362.50
25112	Pz, Car, C1, Tou2, Ivo	352.00	*356.00	349.50	353.80
25111	Pz, Car, C1, Tou1, Has	*356.00	360.00	353.80	362.50
24000	Pz, D, D	360.00	408.00	362.50	408.50
24300	Pz, D, D3	360.00	374.00	362.50	377.40
24320	Pz, D, D3, Fam, Fam	360.00	367.00	362.50	367.00
24310	Pz, D, D3, Fra, Fra	367.00	374.00	367.40	377.40
24200	Pz, D, D2	374.00	387.00	377.40	386.00
24220	Pz, D, D2, Giv, Giv	374.00	380.00	377.40	380.80
24210	Pz, D, D2, Eif, Eif	380.00	387.00	380.80	386.00
24100	Pz, D, D1	387.00	408.00	386.00	408.50
24130	Pz, D, D1, Ems, Ems	387.00	394.00	386.00	390.40
24120	Pz, D, D1, Sie, Sie	394.00	401.00	390.40	396.30
24110	Pz, D, D1, Ged, Ged	401.00	408.00	396.30	408.50
23000	Pz, S, S	408.00	438.00	408.50	439.00
23200	Pz, S, S2	408.00	421.00	408.50	424.00
23220	Pz, S, S2, Prd, Prd	408.00	414.00	408.50	410.70
23210	Pz, S, S2, Lud, Lud	414.00	421.00	410.70	424.00
23212	Pz, S, S2, Lud2, Ldf	414.00	*417.50	410.70	415.10
23211	Pz, S, S2, Lud1, Gor	*417.50	421.00	415.10	424.00
23100	Pz, S, S1	421.00	438.00	424.00	439.00
23120	Pz, S, S1, Wen, Wen	421.00	428.00	424.00	430.40
23123	Pz, S, S1, Wen3, Gle	421.00	*423.33	424.00	425.40
23122	Pz, S, S1, Wen2, Whi	*423.33	*425.67	425.40	426.10
23121	Pz, S, S1, Wen1, She	*425.67	428.00	426.10	430.40
23110	Pz, S, S1, Lly, Lly	428.00	438.00	430.40	439.00
23113	Pz, S, S1, Lly3, Tel	428.00	*431.33	430.40	432.60
23112	Pz, S, S1, Lly2, Aer	*431.33	*434.67	432.60	436.90
23111	Pz, S, S1, Lly1, Rhu	*434.67	438.00	436.90	439.00
22000	Pz, O, O	438.00	505.00	439.00	510.00
22300	Pz, O, O3	438.00	458.00	439.00	463.90
22320	Pz, O, O3, Ash, Ash	438.00	448.00	439.00	443.10
22324	Pz, O, O3, Ash4, Hir	438.00	*440.50	439.00	439.50
22323	Pz, O, O3, Ash3, Raw	*440.50	*443.00	439.50	440.10
22322	Pz, O, O3, Ash2, Cau	*443.00	*445.50	440.10	440.60
22321	Pz, O, O3, Ash1, Pus	*445.50	448.00	440.60	443.10

Code	Abbreviation	DNAG'83 Top	DNAG'83 Bottom	Harland'89 Top	Harland'89 Bottom
22310	Pz, O, O3, Crd, Crd	448.00	458.00	443.10	463.90
22317	Pz, O, O3, Crd7, Onn	448.00	*449.43	443.10	444.00
22316	Pz, O, O3, Crd6, Act	*449.43	*450.86	444.00	444.50
22315	Pz, O, O3, Crd5, Mrb	*450.86	*452.29	444.50	447.10
22314	Pz, O, O3, Crd4, Lon	*452.29	*453.71	447.10	449.70
22313	Pz, O, O3, Crd3, Sou	*453.71	*455.14	449.70	457.50
22312	Pz, O, O3, Crd2, Har	*455.14	*456.57	457.50	462.30
22311	Pz, O, O3, Crd1, Cos	*456.57	458.00	462.30	463.90
22200	Pz, O, O2	458.00	478.00	463.90	476.10
22220	Pz, O, O2, Llo, Llo	458.00	468.00	463.90	468.60
22223	Pz, O, O2, Llo3, lLlo	458.00	*461.33	463.90	465.40
22222	Pz, O, O2, Llo2, mLlo	*461.33	*464.67	465.40	467.00
22221	Pz, O, O2, Llo1, eLlo	*464.67	468.00	467.00	468.60
22210	Pz, O, Ord2, Lln, Lln	468.00	478.00	468.60	476.10
22212	Pz, O, Ord2, Lln2, lLln	468.00	*473.00	468.60	472.70
22211	Pz, O, Ord2, Lln1, eLln	*473.00	478.00	472.70	476.10
22100	Pz, O, O1	478.00	505.00	476.10	510.00
22120	Pz, O, O1, Are, Are	478.00	488.00	476.10	493.00
22110	Pz, O, O1, Tre, Tre	488.00	505.00	493.00	510.00
21000	Pz, Cam, Cam	505.00	570.00	510.00	570.00
21300	Pz, Cam, Cam3	505.00	523.00	510.00	517.20
21320	Pz, Cam, Cam3, Dol, Dol	505.00	*514.00	510.00	514.10
21310	Pz, Cam, Cam3, Mnt, Mnt	*514.00	523.00	514.10	517.20
21200	Pz, Cam, Cam2	523.00	540.00	517.20	536.00
21220	Pz, Cam, Cam2, Men, Men	523.00	*531.50	517.20	530.20
21210	Pz, Cam, Cam2, Sol, Sol	*531.50	540.00	530.20	536.00
21100	Pz, Cam, Cam1	540.00	570.00	536.00	570.00
21130	Pz, Cam, Cam1, Len, Len	540.00	*550.00	536.00	554.00
21120	Pz, Cam, Cam1, Atb, Atb	*550.00	*560.00	554.00	560.00
21110	Pz, Cam, Cam1, Tom, Tom	*560.00	570.00	560.00	570.00
10000	Pro, Pro	570.00	2500.00	570.00	2450.00
14000	Pro3, Z, Z	570.00	900.00	570.00	800.00
14200	Pro3, Z2, V	570.00	*627.00	570.00	610.00
14220	Pro3, Z2, V2, Edi, Edi	570.00	*599.00	570.00	590.00
14210	Pro3, Z2, V1, Var, Var	*599.00	*627.00	590.00	610.00
14100	Pro3, Z1, Stu	*627.00	900.00	610.00	800.00
13000	Pro2, Rif, Rif	900.00	1600.00	800.00	1650.00
13300	Pro2, Rif3, Kar	900.00	*1106.00	800.00	1050.00
13200	Pro2, Rif2, Yur	*1106.00	*1353.00	1050.00	1350.00
13100	Pro2, Rif1, Buz	*1353.00	1600.00	1350.00	1650.00
12000	Pro1, Ani, Ani	1600.00	*2219.00	1650.00	2200.00
11000	Pro1, Hur, Hur	*2219.00	2500.00	2200.00	2450.00
0	Arc, Arc	2500.00	3800.00	2450.00	4000.00
3000	Arc, Arc3, Arc3	2500.00	3000.00	2450.00	*3000.00
2200	Arc, Arc2, Arc2	3000.00	3400.00	*3000.00	*3500.00
1000	Arc, Arc1, Arc1	3400.00	3800.00	*3500.00	4000.00

D8. PAP Environmental Codes

From Ziegler et al, 1985

Elevation	Code	Environments	Geologic Recognition
+10,000			
	9	Collisional mountains	High-T, high-P metamorphics
+4,000			
	8	Andean-type peaks	Andesites/granodiorites in continental setting
+2,000			
	7	Island-arc peaks	Andesites/granodiorites in marine setting
		Rift-shoulders	Adjacent fanglomerates
+1,000			
		Inland plains	Between environments 5 and 7
	6	Rift valleys	Basalts, lake deposits in graben
		Some forearc ridges	Tectonic milanges
+200			
		Coastal plains	Alluvial complexes
	5	Lower river systems	Major floodplain complexes
		Delta tops	Swamps and channel sands
0			
		Inner shelves	Heterogeneous marine sediments
	4	Reef-dammed shelves	Carbonates of Bahamian type
		Delta fronts	Topset silts and sands
-50			
		Outer shelves	Fine sediments, most "bioproductites"
	3	Some epeiric basins	Fine clastics or carbonates
		Pro-deltas	Foreset silts and proximal turbidites
-200			
		Continental slope/rise	Slump/contourite facies
	2	Mid-ocean ridges	Ocean crust less than 20 m.y. old
		Pro-delta fans	Bottomset clays and distal turbidites
-4,000			
	1	Ocean floors	Pelagic sequences on ocean crust

-6,000			
	0	Ocean trenches	Turbidites on pelagic sequences
-12,000			

D9. PAP Lithological Codes

From Ziegler et al., 1985

Clastic-carbonate sediments
- (C) Conglomerate
- (S) Sandstone
- (M) Mudstone, shale
- (L) Limestone

Climatically significant sediments
- (T) Tillite and glacio-marine beds
- (P) Peat, coal
- (D) Dolomite
- (G) Gypsum, anhydrite
- (H) Halite and bittern salts
- (E) Evaporites (G and H above)
- (R) Reefs

Oceanographically significant sediments
- (Q) Bedded chert, radiolarite, diatomite
- (V) Phosphorite
- (W) Ferromanganese nodules and concretions
- (X) Limonite, goethite, or hematite
- (Y) Chamosite
- (Z) Glauconite

Soils
- (N) Nonmarine, nondeposition

Acid-basic volcanic sequence
- (K) Rhyolite, rhyodacite, trachyte, latite
- (A) Andesite, basaltic andesite, dacite
- (B) Basalt, phonolites, basanites, dolerite dikes

Acid-basic intrusive sequence
- (J) Granite, monozonite, adamellite, alkali granite
- (I) Granodiorite, diorite, albitic granite, tonalite
- (F) Foidite, foyaite, exxexite, theralite, etc

"Cooling ages" on intrusive and metamorphic rocks
- (U) Uplift and unroofing

D10. PAP Lithological Summary Codes

1. Conglomerate dominant	CSM, CML, BCS
2. Sandstone with shale	S, SM, SMC
3. Shale with sandstone	MS, MSC
4. Shale	M
5. Clastics with some carbonate	ML, SL, MLS, MLGH
6. Carbonate with some clastics	LM, LHM, LMR, LS
7. Pure carbonate	L, R, LR, LDG

D11. PAP Stratigraphic Reliability

A	Complete biostratigraphic control	control on top and bottom of interval
B	Some biostratigraphic control	a specific age date within the interval
C	Stratigraphic interpolation	data above or below interval which brackets ages
D	Geological inference	lithological correlation with localities with more precise dating
E	Radiometric determination	
F	Secondary information	regional compilations, or age dating or methods of author not specified
G	Guesswork	large timespan undivided (i.e. Lower Cretaceous); guess that specific interval is represented.

GLOSSARY

Based partly on the definitions given in the Helix manuals (Harmon, 1991; Harrington, 1992). For further information see these publications.

Abacus (abaci)..... defines a calculation or operation to be done to a specified data selection in a relation.

Collection..... the database with all of its associated relations and users

Database..... a the site of stored data

Dynamic Pop-up menu..... a field in which a menu of options is drawn from the entries in another field within the relation.

Entry..... a piece of data that is entered into a field by the user.

Field..... a 'column' in a relation. Represents one type of data that represents an entity, e.g. the family name of a taxon, or the bottom age of a locality. Fields can be of a number of types including text, numbers, or flags.

Flag..... a flag field is one which can only be defined as either true, false or unspecified.

Form..... a view. Can be a listing, or a point of entry such as the **ENTER LOCALITIES** entry form.

Host Form..... the form in which a subform resides.

Index..... an ordering of the data in a relation. Indices can be built using any number of fields or abaci or combinations of each from the relation in which the index resides.

Inert field..... a field that does not store the data entered into it.

Link..... here used to denote the unique identifier (a field or abacus) that links two parts of the database together, such as the locality number. For the linking field or abacus to be useful there must be common entries to both that the database can use to make the connection.

Listing..... a list of all records in a relation that satisfy the query parameters for the list.

Pop-up Menu..... a field in which a menu of options has been specified and which appears when the user accesses the field.

Query..... a form used to limit the records in a relation.

Record..... a 'row' in a relation. A record contains data that is true for one unique entity, for instance a locality or taxon name.

Relation..... a related group of data. These are effectively two dimensional tables made up of fields and records (also known as 'columns' and 'rows' respectively).

Sequence button..... this allows access to other parts of the database, such as listings, subforms etc., or operations within the database.

Subform..... a listing form embedded in another form.

Template..... the basic plan used to make the views and queries. Helix Express allows the programmer full control of their design.

User..... a user of the database. For the Vertebrate database there are two Users: Programmer and Data Entry.

View..... a view of a template. Allows access to the data contained in the relation. This is what the users see in custom mode.

REFERENCES

Berggren, W. A., Kent, D. V., Flynn, J. J., & Couvering, J. A. V., 1985, Cenozoic geochronology: Bulletin of the Geological Society of America, v. 96, p. 1407-1418.

Carroll, R. L., 1988, Vertebrate Paleontology and Evolution:. New York: W.H. Freeman and Company. 698 p.

Cihlar, J., L. St.-Laurent, and J. A. Dyer, 1991, Relation between the Normalized Difference Vegetation Index and ecological variables: Remote Sensing of Environment, v. 35, p. 279-298.

Damuth, J., 1993, ETE Database Manual:. Washington, DC: Evolution of Terrestrial Ecosystems Consortium. 195 p.

EndNote, 1990-1991, EndNote plus: In Berkeley, CA: Niles and Associates, Inc.

Goward, S. N., and D. G. Dye, 1987, Evaluating North American net primary productivity with satellite observations: Advances in Space Research, v. 7, p. 165-174.

Goward, S. N., C. J. Tucker, and D. G. Dye, 1985, North American vegetation patterns observed with the NOAA-7 advanced very high resolution radiometer: Vegetatio, v. 64, p. 3-14.

Harland, W. B., Armstrong, R. L., Cox, A. V., Craig, L. E., Smith, A. G., & Smith, D. G., 1990, A geologic time scale 1989:. Cambridge: Cambridge University Press. 263 p.

Harmon, D., 1991, Double Helix Reference Manual:. Northbrook, IL: Odesta Corporation.

Harrington, J. L., 1992, Riding the Helix Express:. Salt Point, New York: Black Gryphon Press.

Hielkema, J. U., S. D. Prince, and W. L. Astle, 1987, Monitoring of global vegetation dynamics for assessment of primary productivity using NOAA Advanced Very High Resolution Radiometer: Advances in Space Research, v. 7, p. 81-88.

Lottes, A. L., and A. M. Ziegler, 1994, World peat occurrence and the seasonality of climate and vegetation: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 106, p. 23-37.

Markwick, P. J., 1992, Fossil Crocodilian distributions, Upper Cretaceous to Present: implications for paleoclimate: *In* S. Lidgard & P. R. Crane (Ed.), Fifth North

American Paleontological Convention. Abstracts and Program, . Chicago: The Paleontological Society, 198.

Markwick, P. J., 1993, Crocodilian diversity and distributional responses to climate changes over the last 100 Ma: GSA Abstracts with Programs, v. 25(3).

Markwick, P. J., In Prepa, Crocodilian diversity patterns. Implications for evolution and biases in the geological record.

Markwick, P. J., In prepb, The effect of time on the interpretation of paleoclimate.

Markwick, P. J., In prepc, Fossil Crocodilian distributions and their implications for paleoclimate: 100Ma to Present.

Mather, J. R., and G. A. Yoshioka, 1973, The role of climate in the distribution of vegetation, *in* G. McBoyle, ed., Climate in Review, Boston, Houghton Mifflin Company, p. 73-84.

Müller, M. J., 1982, Selected Climatic Data for a Global Set of Standard Stations for Vegetation Science: Tasks for Vegetation Science: The Hague, Dr W. Junk Publishers, 306 p.

NOAA-EPA Global Ecosystems Database, 1992, Global Ecosystems Database Version 1.0. User's Guide, Documentation, Reprints, and Digital Data on CD-ROM: Boulder, Colorado, USDOC/

NorthCon Technologies, 1992, Helix Express: In Northbrook, IL: NorthCon Technologies, Inc.

Palmer, A. R., 1983, Decade of North American Geology (DNAG). Geologic Time Scale: Geology, v. 11, p. 503-504.

Peterson, J. T., 1973, The climate of cities: a survey of recent literature, *in* G. McBoyle, ed., Climate in Review, Boston, Houghton Mifflin Company, p. 264-285.

Romer, A. S., 1971, Vertebrate Paleontology: (3 ed.). Chicago: The University of Chicago Press. 468 p.

Running, S. W., and R. R. Nemani, 1988, Relating seasonal patterns of the AVHRR Vegetation Index to simulated photosynthesis and transpiration of forests in different climates: Remote Sensing of Environment, v. 24, p. 347-367.

Sellars, P. J., 1987, Relations between canopy reflectance, photosynthesis and transpiration: links between optics, biophysics and canopy architecture: Advances in Space Research, v. 7, p. 27-44.

Sowerbutts, W. T. C., 1988-1992, WhizAtlas: In Macclesfield: WTC Scientific.

Steininger, F. F., Bernor, R. L., & Fahlbusch, V., 1990, European Neogene marine/continental chronologic correlations: *in* E. H. Linsay, V. Fahlbusch, & P. Mein (Eds.), European Neogene mammal chronology : New York: Plenum Press, p. 15-46.

Thornwaite, C. W., 1948, An approach toward a rational classification of climate: Geographical Review, v. 38, p. 55-89.

Walter, H., 1985, Vegetation of the Earth and Ecological Systems of the Geo-biosphere: Berlin, Springer-Verlag, 318 p.

Ziegler, A. M., Rowley, D. B., Lottes, A. L., Sahagian, D. L., Hulver, M. L., & Gierlowski, T. C., 1985, Paleogeographic interpretation: with an example from the Mid-Cretaceous: Annual Review of Earth and Planetary Sciences, v. 13, p. 385-425.

Ziegler, A. M., 1990, Phytogeographic patterns and continental configurations during the Permian Period, *in* W. S. McKerrow, and C. R. Scotese, eds., Palaeogeography and Biogeography: Geological Society Memoir, London, The Geological Society of London, p. 363-377.