



State of Delaware  
DELAWARE GEOLOGICAL SURVEY  
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## OPEN FILE REPORT NO. 50

# DATABASE OF QUATERNARY COASTAL GEOCHRONOLOGIC INFORMATION FOR THE ATLANTIC AND PACIFIC COASTS OF NORTH AMERICA

*(additional information for sites in Peru and Chile)*

MS Access database containing locality and sample information for sites with amino acid racemization (AAR) and other geochronologic information



Example of a well-preserved late Pleistocene *Mercenaria* sample from East Lake Pit, Dare Co., NC

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# UNIVERSITY OF DELAWARE AMINO ACID RACEMIZATION DATABASE

## INTRODUCTION

Amino acid racemization (AAR) geochronology has been used to estimate the age of Quaternary deposits of the US Atlantic and Pacific coasts for over 40 years (Wehmiller, 1992; Wehmiller et al., 1988; Wehmiller and Miller, 2000; and Wehmiller, 2013a, 2013b). Pellerito (2004) created a comprehensive database of results from these various studies (the Microsoft Access Database that is part of this open-file publication.) The database will be updated regularly to add new data or to complete entries that are currently blank. The instructions provided with the database indicate the date of the latest revision, as well as all revisions after the first release. Some output data from the amino acid racemization database (AARDB) are posted to the NOAA-World Data Center for archival preservation (<http://www.ncdc.noaa.gov/paleo/aar.html>). The following sections describe the major components of the database.

## SAMPLE LOCATIONS

Locations in the database are the sites where samples were collected for AAR geochronology. Samples from at least 95 percent of these locations were in a collection at the University of Delaware, that are now in the process of being transferred to several museums or other repositories. Additional locations where samples were collected for paleontological or separate geochronological study are included if they are directly relevant to AAR research conducted at the University of Delaware.

Location information in the database is usually associated with a specific collector whose name is listed in the database. In most cases, University of Delaware researchers were responsible for the collections. All locations are assigned a “UDAMS” number (University of Delaware AMinoStratigraphy) that uniquely identifies a collection site. If multiple collections were made at a site, each collection was assigned a specific UDAMS number; therefore, each number identifies a unique place and date of collection.

Latitude/longitude is reported for most locations to either one or two decimal positions to indicate an uncertainty as to where the collection was made. In a few cases, the latitude and longitude is not entered or is deliberately entered incorrectly as a reminder that confirmation of a location is required. The UDAMS number, however, indicates that a collection actually exists.

More recent collections are usually associated with GPS data, or very precise surveying, and the latitude and longitude for these sites is often reported to five or more decimal positions. A column in the database labeled “Coordinate precision” represents a best estimate of the location’s uncertainty.

Although the original purpose of this database was to focus on Atlantic and Gulf Coast localities and collections, information for sites along the Pacific Coast of both North and South America also is included. This work was conducted

during the earlier phases of the University of Delaware program in coastal aminostratigraphy between 1975 and 1995. Location numbers for all Pacific Coast sites are those of the collector’s institution—in most cases, US Geological Survey (USGS) Menlo Park or Los Angeles County Museum of Natural History. The databases for these collections are as follows:

### USGS Menlo Park:

[www.ucmp.berkeley.edu/science/invertebrate\\_coll.php](http://www.ucmp.berkeley.edu/science/invertebrate_coll.php)

### Los Angeles County Museum of Natural History:

[www.nhm.org/site/research-collections/invertebrate-paleontology](http://www.nhm.org/site/research-collections/invertebrate-paleontology)

One of the important categories in the “location” table of the AARDB is shown in a column labeled “Map100K.” In most cases, the entry in this column corresponds to the USGS 1:100,000 quadrangle in which a collection site is found. In some cases, a generic term such as “Peru” or “Nova Scotia” is used because the collections are from sites not found on USGS 1:100,000 maps. AAR age estimates are affected by sample temperature; therefore, this approach to grouping sites is particularly useful when searches within the AARDB are conducted for all results within a well-defined region.

## ANALYTICAL METHODS

The majority of the analytical results reported in this database are for the extent of racemization of various amino acids. Methods have varied over the period represented by the reported results. Two general categories of results are reported: gas chromatography, used extensively between 1975 and 1988, and then again with newer systems from 1997 to present; and ion exchange liquid chromatography, used extensively between 1985 and 1996. The liquid chromatographic methods yield data for the extent of racemization (technically epimerization) of one amino acid, isoleucine. The gas chromatographic methods yield data for at least five amino acids (often eight). The two analytical methods for the AARDB are summarized in Wehmiller and Miller (2000). Some results have been obtained using chromatographic methods described by Kaufman and Manley (1998).

## RESULTS

The regional geologic context for these results, with specific examples of how selected AAR results can be used for geochronologic interpretation of coastal stratigraphy, is summarized in the publications listed in the References section of this report. The user of this database is referred to these publications for discussions and interpretation of the results. The database does not contain age interpretations derived from the AAR results, although future versions of

the AARDB may include these interpretations in some cases. Relevant radiocarbon data obtained on splits of the AAR samples are contained in the database.

Several approaches are used to report the analytical data. Each analysis has a specific and unique laboratory number (subsample ID), the first digits of which are the year in which the analysis was conducted (e.g. 99XXXX or 2005YYYY). The remaining digits are assigned sequentially during the year of analysis, so lab number 20050105 would be the 105th sample started in 2005.

Multiple lab numbers are associated with a single sample when different fragments were cut from the same shell. Individual shells are assigned individual sample numbers. These sample numbers are often similar to collection numbers (the numbers placed on a bag of shells collected from a site.) An example of the of hierarchy of sample identification is as follows:

UDAMS number	e.g. 07500
Collection Number	e.g. JW99-190
Sample number	e.g. JW99-190-001
Subsample number	e.g. 2001050

Analytical data are listed in the database by subsample number and chromatogram date (with associated instrument run number). The D/L values are reported by peak area (the ratio of areas of the D- and L- peaks). In more recent cases, data for peak height ratios are also included. Differences between peak area and peak height ratios are usually quite small (<3%); if larger, then an interfering peak in the chromatogram is implied.

A short instructional guide is included with the AARDB.

#### VALUE OF THE AARDB

The greatest value of this database is that it documents the history of the collection and analysis of samples from hundreds of Quaternary units in both North and South America. Samples from these sites are, in most cases, irreplaceable. This database informs potential users about existing data related to sites of interest and the current locations (museums, etc.) of samples from these collection sites. As new techniques emerge in the future for paleoenvironmental or geochronological analyses, it will be important that existing samples be available for future research.

The version of the AARDB that is available on-line contains all the “raw” data and metadata for the University of Delaware collection. Pellerito (2004) developed associated tools for the AARDB that allow summaries of data to be generated using a number of search criteria. These search criteria include, but are not limited to: all results within a particular latitude/longitude grid; all results within a particular 1:100,000 map region; all results for a particular genus; all results for particular types of collections (core, surface, etc.).

#### MID-ATLANTIC DATA RELEVANT TO DELAWARE

Tables of summary data from the AARDB for each of the eight USGS 1:100,000 quadrangles (Dover, Atlantic City, Seaford, Cape May, Leondardtwn, Salisbury, Tappahanock,

and Chincoteague) that bracket the mid-Atlantic region are included in Appendix A. These tables contain columns for all the possible data that is included in the AARDB. Empty fields indicate data that remain to be identified and entered in the AARDB.

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