**DESCRIPTION OF DATATABLES**

The datelist contains a grand total of 1116 dated shells. They show a varying content concerning regions, models and different isotopes measured. The main subject of the article is shells from a Holocene geophysical context based on the three isotopes 13C, 14C and 18O.

There is also significant amount of shells from an archaeological context, recent shells containing the bomb peak, and not dated shells with only their stable isotopesmeasured.

The data are organized in 21 tables, called A1-A21 and are described below.

The main data tables are A1-A8, they correspond to the coastal provinces and regions in the Netherlands - see Figure 1. The regions Zeeland (A1), Noord Holland (A3), Friesland (A4), Groningen (A5), and Wadden (A6) are modelled according to the "precipitation fed" rivers (model “P”). For Zuid Holland (A2) the "Rhine" formulas are applied (model “R”).

The shells collected at the North Sea (A8), originate not far from the Dutch coastline. For these, both "P" and "R" calculations are shown.

For Flevoland (IJsselmeer) only P calculations are shown for the older shells (A7). During the first millennium AD, the IJssel broke through, adding Rhinewater. This resulted in complex mixing, calulated using model Z for the younger shells.

For Zuid Holland, some waters/shells need to be analysed using the P model in the Rhine/Meuse delta. This has to do with the changes in the course of the rivers during the Holocene. In some cases it is not clear which is the main water source at a certain time (Hijma, 2009). The shell samples have therefore also been analysed by model P (Table "A2 alternative") as an option for users. A similar situation occurs in southwestern North Holland, where at certain times there has been Rhine influence (Vos, 2015). Some samples for this province are therefore additionally analysed by model R, and shown in "Table A3 alternative".

The Wadden Islands form a separate region. They belong to the three northern provinces but are considered one geohysical unit (Vos, 2015). The model P applies.

For Utrecht/Gelderland only 4 shells dates are available. This concerns Rhinewater but the locations are far from the coastline. The shells are freshwater species, there is no estuary situation; hence model R does not apply. The shells are analyzed using 14aSYS=85%, the common recent value for the Rhine. This we call model F, shown in Table A9. The table is supplemented with one freshwater shell from Groningen.

The tables A1-A8 and A14-A15 show the measured isotopic data, administrative data (lab numbers, locations, coordinates/depths when available), shell species, model calculations and final dates including calibration using IntCal20 (Reimer et al., 2020). The model is "P" and/or "R", referring to freshwater contributions from precipitation fed rivers or the Rhine.

Tables A10-A13 contain results from submodels called "S", "Z", "L" and "T". These are all special cases. Their data (administrative and measured) and P or R calculations are in the main tables (A1-A8, A14,A15), but for the final dates is referred to A10-A13 because these are calculated in a different way. Model S refers to stagnant waters, i.e. not connected to flowing rivers or the sea. Models Z and L refer to complex mixing situations for Zuiderzee and Lakes; these change through historical periods, and can be traced by (pre)historical information, chlorinity and other specific parameters. The general models "P" and "R" are not valid in these cases. Calculations are specific per sample and will be presented in a separate treatise. However in order to be complete, the resulting dates are shown in Tables A11 and A12. This concerns a relatively small number of shells.

Table A13 shows the results of model T. Model T refers to shells with deviating 18O value, indicating lower temperatures and thus more northern origin. This requires a special correction. The calculations are explained in appendix E.

Table A14 shows shells fom an archaeological context. These contain shells for which the 3 isotopes 13C, 14C and 18O are measured, as well as shells for which no 18O value is measured.

This table contains extra columns (nr. 35-37) with extra context information, when available.

There is a large dataset for which only the C isotopes are measured, thus not the 18O isotope. These are shown in Table A15.

We note that the analysis of 18O isotope is seldom requested by the submitter, but has been frequently measured because of our own interest. Today the 18O isotope is measured as a standard by most modern laboratories; this was not the case in previous decades.

Table A15 does contain 18O values, which are estimated. Our dataset is rich enough that an educated guess for 18O is possible, thereby introducing an extra (but hard to quantify) uncertainty. The estimated 18O value enables application of our model. This is even possible for shells from the Netherlands without 18O data measured elsewhere, in particular a series from Utrecht (AMS, UtC), one from Hannover (conventional, Hv) and three from Glasgow (AMS, SUERC). These are not included in our datelists.

Table A16 shows results of 14C dates for shell carbonates from the early days of the Groningen Radiocarbon laboratory, before the so-called Radiocarbon convention was introduced. Only 14C is measured (by the conventional method), and no stable isotopes (no 18O, but also no 13C) have been measured. The first shells were dated in Groningen in 1953 (van Straaten, 1954; de Vries, 1958). These measurements have shown to be still useful and are inluded here for completeness. Their 13C and 18O values can also be estimated.

Table A17 contains data for shells from the modern era. Most have collection dates and are influenced by anthropogenic effects, in particular the “bomb peak” (Hua, 2022) and fossil fuel effect (Suess, 1955). Also here, the table contains shells for which the 3 isotopes 13C, 14C and 18O are measured, plus also the shells for which no 18O was measured.

Table A18 shows a few shells which appeared to date to the Pleistocene or to the oldest part of the Holocene, outside the scope of our article. Note that also some shells from the North Sea (shown in Table A8) are “old” (i.e. Late Glacial).

Tables A19 and A20 contains shells which have been analysed for their stable isotopes 13C and 18O only, but which were not dated by 14C. They are taken from the thesis of Mook (1986). The data in Table 19 are from the Eemien era; those in Table 20 are Holocene and recent shells.

Table A21 is a catalog, the main reference and guiding table. It contains a list of all 14C dated samples, sorted on the laboratory code number used: GrA, GrN, Ua and GrM. The table A21 refers to the appropriate table(s) A1-A20 where the data can be found, and indicates the (sub)model used. A number of shells appear in more than one table, depending on how they are analyzed.

Below follows a description of columns in the main datatables A1-A8 and A14-A15. They contain 4 kinds of information: administrative data, measured isotopic data, model calculations, and final calender age of the shell.

The data are all sorted to laboratory number (in the sequence GrA, GrN, Ua and GrM).

*administrative data*

The administrative information includes laboratory number (column 1), location (columns 2,3), coordinates (columns 23-26) and depth (column 27) when available.

The local coordinates in the tables (when known) are given as RD-coordinates ("Rijksdriehoekscoordinaten"). These are relative to the "Onze Lieve Vrouwen Toren" in Amersfoort which is located at 5°23'15" East and 52°09'22" North, and has the defined RD coordinates x=155.000 and y=463.000 (Atlas, 1998). In some cases the coordinates are given in longitude and latitude (NB, North latitude and OL, East longitude) by the submitter of the sample, and has been entered as such in the laboratory databases.

When known, the depth were the samples were taken is shown in the tables. These are given in m NAP which is Normal Amsterdams Peil, or Dutch Ordinance Datum (approximately the present sea level). In a few cases, because the finds are above NAP; in these cases the "depth" numbers are shown as a negative number. In some cases (in particular for the province of Groningen), the depth is estimated.

*measured isotope data*

Columns 4 and 5 show the measured activity 14a in % (not-normalized to 13C = -25‰) and its 1-sigma uncertainty. Columns 6 and 7 show the 14C age (not-normalized, thus not in BP) and its 1-sigma uncertainty, calculated from the measured 14a value.

In some cases GrN dates show exceptionally large measurement errors, for example GrN-14231 in Table A3. This is mostly caused by a small sample (not enough material) for the conventional method. At the time of measuring there was no AMS available.

Columns 8 and 9 show the measured 13C and 18O values, respectively. They are measured by stable isotope mass spectrometry and given in ‰ relative to their respective standards.

*modelled isotope data*

Column 10 shows the 13C value, corrected for the estuary effect based on the 18O value of the shell, using equations [9] or [10] for model P and R, respectively.

Column 11 shows the difference between the measured and corrected 13C value (called ), see equation [17].

Column 12 shows the recent 14C activity for the estuary 14aSYS(est), using the equations [13] or [14] for model P and R, respectively.

Column 13 shows the species of shell, when known. Column 14 shows the parameter  which is determined by the feeding behaviour of the shell species. Abbreviated code names are used. For the full species names see Appendix C. The secondary carbonate activity calculated either using  = 0.5 and 1, in a few exceptional cases  = 0. When the species is unknown, we use  = 1.

Columns 15-18 relate to the secondary carbonate effect, to be applied for shells with >0.

Column 15 shows the recent 14C activity for the secondary carbonate effect 14aSYS(sec), calculated by equation [24] or [26] for model P and R, respectively.

Column 16 shows the total recent 14C activity for the secondary carbonate effect together with the estuary effect, using equation [28].

Column 17 shows the final 14C activity for the shell sample: 14a(fin) = 100\*14a(measured) /  14aSYS(tot), which leads to the 14C age of the shell (column 18) calculated by equation [30].

Columns 19-21 relate to the exchange effect, to be applied for shells with <0.

Column 19 shows the estuary age, calculated from the recent 14C activity for the estuary:

age(est) = -8033 ln[14a(measured) / 14aSYS(est)].

Column 20 shows the magnitude of the exchange effect, which equals 109 . This leads to the 14C age of the shell (shown in column 21): age (exch) = age(est) + 109 

Column 22 shows the modelled age; it is either the value from column 18 (for >0) or from column 21 (for <0).

The final dates and its uncertainties () are shown in columns 28 and 29, respectively.

Again, these are modelled 14C dates, not conventionally normalized for fractionation; formally they are therefore not numbers in BP. But they are the equivalent.

The uncertainties are 1-sigma, taken as the measurement error which is also reported to users.

The 14C dates are calibrated using the most recent curve IntCal20 (Reimer et al., 2020). The calibrated dates and probability ranges are given in columns 30-31, showing the 95.4% probability range in calBP, i.e. calender years relative to AD 1950.

All final age values (columns 28-31) are rounded to 5.

Column 32 equals column 1 (laboratory number), it is included to increase the readability of the large spreadsheet. Column 33 specifies the model used, column 34 is used for remarks. The numbers in this column refer to the following:

1. occasional result which is problematic but there is no scientific reason for rejection

2. shell with excess 18O values, calculated by model T

3. final dates calculated by model S

4. final dates calculated by model Z

5. estimated values for sample depth

6. estimated values for 18O

7. estimated calender year for the sample

8. final dates calculated by model L

9. freshwater shell (not marine), modelled using 14aSYS = 85%

10. thick sediment layer, average depth is shown

11. stable isotope ratios are averaged values from more than one measurement