J. Fort, Dispersal distances and cultural effects in the spread of the Neolithic along the northern Mediterranean coast, *Archaeological and Anthropological Sciences*

Supporting Information

S1. Details on the database used

The results in the main paper are based on a new database that is included as a Supp. Info. excel file and has been prepared by using the following databases/references (as suggested by a reviewer). We have calibrated all dates at https://c14.arch.ox.ac.uk/oxcal/OxCal.html (Oxcal 4.4) with 95.4% probability (curve IntCal20).

(1) Alday, A. & Soto, A. Poblamiento prehistórico de la península ibérica: dinámica demográfica versus frecuencias del C14. *Munibe Antropologia-Arkeologia* **69**, 75-91 (2018).

J. Fort tried to access the internet links in this paper but they did not work, so he asked Prof. Alday. His answer was that this reference and the internet links that it contains are outdated. Prof. Alday kindly provided a database with 115 early Neolithic sites in Iberia. It does not include any dates of unknown material, shell, charcoal neither human bone. Dates with standard deviation larger than 100 years were also excluded. We used the oldest date per site. The reference of each sample and/or the name of its site was used to identify its location in the database of about 11,000 Iberian sites by Alday and Mejías that is publicly available (https://sites.google.com/view/c14peninsulaiberica/dataciones-14).

(2) Antolín, F., Martínez, P., Fierro-Milà, E., León, M., Martínez, H., Gascón, M., Prats, C., Barceló, J.A. & Edo, M. Towards the periodization of the uses of Can Sadurní Cave (Begues, Catalonia) during the Middle Neolithic I. The contribution of Bayesian modelling to radiocarbon dating sequences. Ibercrono. Actas del congreso de cronometrías para la historia de la península ibérica. Barcelona, 17-19 October 2016. CEUR Workshop Proceedings, vol. 2024 (2017). http://ceur-ws.org/Vol-2024/IberCrono_06.pdf

This reference contains only dates on the middle Neolithic, but it provides the following citation with early Neolithic dates from the same site: Edo, M. & Antolín, F., Cova de Can Sadurní, la transformació d'un jaciment. L'episodi sepulcral del neolític postcardial. *Tribuna d'Arqueologia* **2013-2014**, 80-104 (2016). This is the reference that we have used. The oldest Neolithic date (6,421 +- 34, Cardial) has been obtained from Fig. 3. Its date is the same as that in the previous database (1) Alday & Soto, and it also has the same laboratory reference (OxA-15488).

(3) Bergadà, M. M., Cervelló, J. M., Edo, M., Cebrià, A., Oms, F. X., Martínez, P., Antolín, F., Morales, J. I. & Pedro, M. Chronostratigraphy in karst records from the Epipaleolithic to the Mid/Early Neolithic (c. 13.0-6.0 cal ka BP) in the Catalan Coastal Ranges of NE Iberia: environmental changes, sedimentary processes, and human activity. *Quaternary Science Reviews* **184**, 26-46 (2018).

This paper deals with the can Sadurní and Guineu caves. The oldest Neolithic date has been obtained from table 1 and 2, respectively.

(4) Bernabeu, J., Barton, C. M., Pardo Gordo, S. & Bergin, S. M. Modeling initial Neolithic dispersal. The first agricultural groups in West Mediterranean. *Ecol. Model.* **307**, 22-31 (2015).

This publication includes a database (Supp. Info. 2, table 1) in which samples are classified from highest to lowest quality as: 1) domestic plants or animals, 2) other short-lived taxa (e.g., unburnt animal bones or shrubs), and 3) long-lived taxa (mainly tree wood) and burnt charcoal. We have considered samples belonging to groups 1) and 2). This database reports calibrated dates with 1 σ range, but uncalibrated dates are not provided. In order to use the same probability range and calibration curve for all databases, for the sites of the samples mentioned we have used oldest Neolithic uncalibrated dates (excluding long-lived samples) from the more recent database by the same authors: Pardo-Gordó, S., García-Puchol, O., Bernabeu, J. & Díez-Castillo, A. (2018), Radiocarbon dates for the Mesolithic-Neolithic transition in Iberia, https://zenodo.org/record/3241958#.Yat3mFXMKpp.

(5) Binder, D., Angeli, L., Gomart, L., Huet, T., Maggi, R., Manen, C., ... & Tusa, S. The North-western Impressed Wares: a chrono-cultural overview. In 1st Conference on the Early Neolithic of Europe-ENE 2019 (Nov. 2019).

J. Fort could not find this work, so he asked C. Manen about it. The answer was 'Unfortunately I can't send you this pdf because it was a conference presentation, not published yet'.

(6) Binder, D., Lanos, P., Angeli, L., Gomart, L., Guilaine, J., Manen, C., *et al.* Modelling the earliest north-western dispersal of Mediterranean Impressed Wares: new dates and Bayesian chronological model. *Documenta praehistorica* **44**, 54-77 (2017).

This paper focuses on the Impressa, which predates the Cardial. It considers only short-lived samples, and excludes all material potentially affected by the marine or fresh-water reservoir effect (i.e., shells). We have used the dates in their Appendix (table 1). We do not include sites close to the eastern Italian coast, Corfu neither the Balkans (see their Fig. 1) because they correspond to a different area than that analyzed by us (namely, the coast from southwestern Italy to central Portugal).

(7) Drake, B. L., Blanco-González, A., & Lillios, K. T. Regional demographic dynamics in the Neolithic transition in Iberia: results from summed calibrated date analysis. Journal of Archaeological Method and Theory **24** (3), 796-812 (2016).

This paper includes a list of 1,165 dates in Iberia (Table S1) but does not distinguish between Mesolithic and Neolithic ones, so it has not been possible to select the latter.

(8) Fyfe, R. M., Woodbridge, J., Palmisano, A., Bevan, A., Shennan, S., Burjachs, F., Legarra Herrero, B.J., García Puchol, O., Carrión, J.S., Revelles, J. & Roberts, C. N. Prehistoric palaeodemographics and regional land cover change in eastern Iberia. *The Holocene* **29**, 799-815 (2019).

This database is not available as Supplementary Information in the journal webpage. It was kindly sent by A. Palmisano to J. Fort. It contains 3,885 dates from 814 sites in Eastern Iberia from 11,000 cal BP to the present. We used the dates corresponding to the early Neolithic in the areas analyzed by us (Catalonia, Valencia and Andalusia).

(9) García Puchol, O., Diez Castillo, A. & Pardo-Gordó, S. New insights into the neolithisation process in southwest Europe according to spatial density analysis from calibrated radiocarbon dates. *Archaeological and Anthropological Sciences* **10**, 1807-1820 (2018).

These authors consider Mesolithic and Neolithic dates in Iberia excluding shells, human bones and dates with standard deviation above 150 years (p. 1810). We have selected the oldest date per site from coastal areas in their Iberian Neolithic database (Table S2), which includes exclusively dates from domestic samples (p. 1812 and Fig. 6). As mentioned for database (6), we consider dates in the area we are interested in (i.e., the northern Mediterranean coast from southwestern Italy to central Portugal).

(10) García-Puchol, O., Díez Castillo, A. A. & Pardo-Gordó, S. Timing the Western Mediterranean last hunter-gatherers and first farmers. In Times of Neolithic Transition along the Western Mediterranean, pp. 69-99, eds. García-Puchol, O. & Salazar-García, D. C. (Springer, Cham, 2017).

This database includes dates from Italy, France, Spain and Portugal. The authors include dates with a clear archaeological context and standard deviation equal or inferior to 100 years. They applied two additional filters (pp. 75 and 77): (1) removal of all marine and human bone samples that can be affected by fluctuations of the reservoir effect; and (2) keeping only single short-life samples to avoid old wood effects. The final database of Neolithic dates on domesticates (table 4.2) was kindly provided by O. García-Puchol in excel format. We have used the oldest date for each site. Analogously to databases (6) and (9), we consider dates in the area we are interested in (i.e., the northern Mediterranean coast from southwestern Italy to central Portugal).

(11) Manen, C., Perrin, T., Guilaine, J., Bouby, L., Bréhard, S., Briois, F.,Durand, F., Marinval, P. & Vigne, J. D. The Neolithic transition in the western Mediterranean: A complex and non-linear diffusion process—the radiocarbon record revisited. *Radiocarbon* **61** (2), 531-571 (2019).

The data appear in table 1 and Appendices 1-3. As already mentioned above for databases (6), (9) and (10), we do not include sites close to the eastern coast in southern Italy, Greece neither Croatia because they correspond to a different area than that analyzed by us (namely, the coast from southwestern Italy to central Portugal). Dates of poor reliability (as indicated in table 1 of this paper) were excluded before selecting the oldest date per site.

(12) Ibáñez-Estévez, J. J., Gibaja Bao, J. F., Gassin, B. & Mazzucco, N. Paths and rhythms in the spread of agriculture in the western Mediterranean: the contribution of the analysis of harvesting technology. In Times of Neolithic Transition along the Western Mediterranean , eds. García-Puchol, O. & Salazar-García, D. C., pp. 339-371 (Springer, Cham, 2017).

Dates were obtained from table 13.1. We selected the oldest date for each of the sites we are interested in (namely, those located in coastal areas from southwestern Italy to central Portugal). Dates classified as middle Neolithic were excluded.

(13) Martínez-Grau, H., Jagher, R., Oms, F. X., Barceló, J. A., Pardo-Gordó, S. & Antolín, F. Global processes, regional dynamics? Radiocarbon data as a proxy for social dynamics at the end of the Mesolithic and during the Early Neolithic in the NW of Mediterranean and Switzerland (ca. 6200-4600 cal BC). *Documenta Praehistorica* **47**, 170-191 (2020).

The authors gathered a total of 948 Mesolithic and Neolithic radiocarbon dates of 187 sites (see their Supp. Mat. 3 file). For our purposes, the relevant dates are those classified as early Neolithic and located in coastal regions (see the map in their Fig. 1). We used the oldest date per site and excluded dates with poor reliability (for such dates, an additional column in their database states which filtering criteria are not satisfied).

(14) Martínez-Grau, H., Morell-Rovira, B. & Antolín, F. Radiocarbon Dates Associated to Neolithic Contexts (Ca. 5900-2000 Cal BC) from the Northwestern Mediterranean Arch to the High Rhine Area. *Journal of Open Archaeology Data* **9**, 1-10 (2021).

This work contains 3,690 Mesolithic and Neolithic radiocarbon dates. As for database (13), the dates relevant to us are those classified as early Neolithic and located in coastal regions, and we used the oldest date per site excluding dates with poor reliability (for such dates, a column in their database gives the filtering criteria that are not satisfied).

(15) Martins, H., Oms, F. X., Pereira, L., Pike, A. W., Rowsell, K. & Zilhão, J. Radiocarbon dating the beginning of the Neolithic in Iberia: new results, new problems. *Journal of Mediterranean Archaeology* **28**, 105-131 (2015).

We use the dates targeted by the authors (namely, those on material qualifying for levels 1-3 of Zilhao's sample significance ranking, see p. 108) for the new data reported in this paper (tables 2 and 4) as well as for those previously available (table 5b).

(16) Oms, F. X., Terradas, X., Morell, B. & Gibaja, J. F. Mesolithic-Neolithic transition in the northeast of Iberia: Chronology and socioeconomic dynamics. *Quaternary international* **470**, 383-397 (2018).

We selected the oldest Neolithic date per site from the Supplementary Data (Appendix A) to this paper.

(17) Perrin, T., Manen, C., Valdeyron, N. & Guilaine, J. Beyond the sea… The Neolithic transition in the southwest of France. *Quaternary International* **470**, 318-332 (2018).

We include the 3 reliable Neolithic dates in this paper (table 1) but none corresponds to the Impressa, i.e., all 3 are clearly later than the earliest Neolithic dates for France (see the very interesting Fig. 2 in this paper). Excluding them would not change the earliest date in this region (France), i.e., all results would be the same.

(18) Perrin, T. & Manen, C. Potential interactions between Mesolithic hunter-gatherers and Neolithic farmers in the Western Mediterranean: The geochronological data revisited. *PLoS One* **16**, e0246964 (2021).

This database is based on 3,555 dates from Epipaleolithic, Mesolithic and Neolithic sites in Europe and the Maghreb. However, these dates cannot be used for our purposes because each one was estimated by combining several dates using a Bayesian model. It makes no sense to compare them to the *oldest* regional dates on individual samples (which are those appearing in all other 17 databases above). This is very clear from the following example: for the site Pont de Roque-Haute, the database (6) Binder et al., *Docum. Praehist.* 2017 includes 5 dates (p. 76), the *oldest* of which is 7010+-60 uncal BP or 6005-5755 cal BC (see database (11) Manen et al, *Radiocarbon* 2019, table 1). However, the Bayesian model based on these 5 dates gives the result 5767-5739 cal BC (table 6 in Binder et al., *Docum. Praehist*. 2017), which is substantially more recent than the *oldest* date mentioned above (6005-5755 cal BC).

Fortunately, it has been possible to use the original dates on individual samples thanks to the fact that T. Perrin kindly provided access to his database of European and African prehistoric data (BDA, https://bda.huma-num.fr/) as well as several excel files with all original data. For each site with Neolithic dates of high reliability (classified as '1-Excellent') in the excel file 'Dates', we selected the oldest date. This file contains calibrated ranges only, so we used this calibrated range and the laboratory reference of the corresponding sample to find the uncalibrated date and its error in the BDA (https://bda.huma-num.fr/, section 'Dates'). Finally we calibrated this range again, to make sure that all dates in our database have been calibrated using the same probability (95.4%) and calibration curve (IntCal20). Analogously to other databases above [e.g., (6), (9), (10) and (11)], we consider early Neolithic dates in the area we are interested in (i.e., the northern Mediterranean coast from southwestern Italy to central Portugal).

(19) Zilhao, J. New evidence from galeria da Cisterna (Almonda) and gruta do Caldeirão on the phasing of central Portugal's early Neolithic, Open Archaeol. 7, 747-764 (2021).

This paper was not included in the list of the 18 references above suggested by a reviewer. In spite of this, in our database (Supp. Info. excel file) we have also included a date for the site of Caldeirão that is reported in this paper and is older than all dates for the same site in the other 18 databases above.