



Research Article

Francisco Martínez-Sevilla*, Emma L. Baysal, Roberto Micheli, Fotis Ifantidis, Carlo Lugliè

A Very Early “Fashion”: Neolithic Stone Bracelets from a Mediterranean Perspective

<https://doi.org/10.1515/opar-2020-0156>

received December 28, 2020; accepted June 18, 2021

Abstract: Ring-shaped objects, used mainly as bracelets, appear in the archaeological record associated with the first farming societies around the Mediterranean area. These bracelets, among other personal ornaments, are related to the spread of the farming economy in the Mediterranean (10th–6th millennium BC). In particular, stone bracelets, given their intricate technology, are linked with the early stages of craft specialization and the beginnings of complex social organization. Likewise, their frequency in Early Neolithic assemblages and the lithologies in which they were made have become an important element in the study of the circulation networks of goods, as well as the symbolic behaviors and aesthetic preferences of the first farming groups. This research provides the first overview of the stone bracelets of Neolithic groups in the Mediterranean. We compare the similarities and differences among these ornaments in different geographical zones across the region including Turkey, Greece, Italy, and Spain. Using all the information available about these ornaments – chronology, typology, raw materials and manufacturing processes, use-wear, repair, and alteration practices – we shed light on a complex archaeological trans-cultural manifestation related to the spread of the Neolithic lifestyle across the European continent.

Keywords: personal ornaments, stone bracelets, typology, raw materials, chronology

1 Introduction

The spread of the farming economy in the Mediterranean area is one of the most interesting and complex archaeological phenomena of Late Prehistory (10th–6th millennium BC). Archaeological evidence of the early Neolithic groups in different areas is linked with a rise in the importance of personal ornaments. These objects increase over previous periods in technology, raw material variability, and, in general, their finished quality. Personal ornaments, even in the present day, are elements that embody and signify the individual's identity within a human or cultural group (Roach-Higgins & Eicher, 1992; Miller, 2009; Seeger, 1975; Turner, 1995). Thus, adornments are used by humans as a cultural or ethnic element that allows the individual to

Special Issue: THE EARLY NEOLITHIC OF EUROPE, edited by F. Borrell, I. Clemente, M. Cubas, J. J. Ibáñez, N. Mazzucco, A. Nieto-Espinet, M. Portillo, S. Valenzuela-Lamas, & X. Terradas

* **Corresponding author: Francisco Martínez-Sevilla**, Department of History & Philosophy, Prehistory Section, University of Alcalá, 28880 Alcalá de Henares, Spain, e-mail: f.martinezs@uah.es

Emma L. Baysal: Department of Archaeology, Ankara University, Ankara, Turkey

Roberto Micheli: MIC – Soprintendenza Archeologia, Belle Arti e Paesaggio del Friuli Venezia Giulia, Trieste, Italy

Fotis Ifantidis: Department of Cultural Technology & Information, The University of Aegean, Mytilene, Greece

Carlo Lugliè: LASP – Laboratory of Sardinian Antiquities and Palaeoethnology, Department of Humanities, Languages and Cultural Heritage – Archaeological Branch, University of Cagliari, Cagliari, Italy

belong to the group and also as a medium of acculturation (Bourdieu, 1977). As a result, ornaments have been one of the most important elements in the study of acculturation systems or diffusionism in different prehistoric periods (e.g., Newell, Kielman, Constandse-Westermann, van Gijn, & van der Sanden, 1990; Rigaud, d'Errico, & Vanhaeren, 2015). Thus, they are an important object through which to analyze the socio-economy of, and the interrelationships among, Neolithic societies (e.g., Alarashi, 2016; Fromont, 2013; Martínez-Sevilla, 2018; Micheli, 2012a; Wright & Garrard, 2003). Personal ornaments from Neolithic groups in the Mediterranean area include a large variety of types (beads, drilled teeth, pendants, rings, and bracelets) and a wide range of raw materials (diverse lithologies, marine shells, bone, or clay). These adornments, in general, have been considered as temporal markers, exchange goods, and objects of social differentiation in diverse European areas for the Early Neolithic (e.g., Gavilán Ceballos & Rafael Penco, 1999; Harrison & Orozco Köhler, 2001; Ifantidis & Nikolaidou, 2011; Martínez-Sevilla, 2019; Micheli, 2012b; Noain Maura, 1996; Orozco-Köhler, 2016; Pascual Benito, 1998; Rubio De Miguel, 1993).

Among all these ornaments, stone ring-shaped objects, used mainly as bracelets, are significant cultural items related to the first farming communities in several areas of the Mediterranean. The necessarily complicated *chaîne opératoire* to make stone bracelets marks the beginnings of specialized craft and it, together with other socioeconomic elements, contributed to the origin of complex social organization (Astruc *et al.*, 2011; Baysal, Baysal, Türkcan, & Nazaroff, 2015; Wright & Garrard, 2003; Wright *et al.*, 2008). Stone bracelets are dispersed throughout the Fertile Crescent, Turkey, Greece, Italy, France, Portugal, and Spain. Studies of Neolithic stone bracelets have focused on different features (raw materials, typology, morphology, and functionality among others), as well as their circulation as exchangeable goods, to reveal their value throughout Europe as cultural symbols (Baysal *et al.*, 2015; Fromont, 2013; Martínez-Sevilla, 2018; Micheli, 2012b; Pailler, 2007; Pétrequin *et al.*, 2017).

Here, we carry out the first overview of Neolithic stone bracelets for the Mediterranean area. We compare similarities and differences of these ornaments in several geographical areas across the region using data from Turkey, Greece, Italy, and Spain. With the information available about these ornaments – chronology, typology, raw materials, use-wear, repair, and alteration practices – we shed light on a complex archaeological transcultural phenomenon related to the spread of the Neolithic lifestyle across the European continent.

2 Material and Methods

The spatial framework of this research is broadly the territories surrounding the north of the Mediterranean Sea. Four regional zones have been defined according to the distribution of the bracelets and the number of archaeological sites (Figure 1). These areas correspond with the spread of the Neolithic from east to west from southwest Asia across the European continent and the Mediterranean coast.

The present study is based on regional research by the authors. These analyses of ornaments and stone bracelets include syntheses of Turkey (Baysal *et al.*, 2015), Greece (Ifantidis, 2019), Italy (Micheli, 2012a, 2012b, 2014), and Iberia (Martínez-Sevilla, 2018, 2019). We have analyzed stone rings from 275 archaeological sites (Turkey 20; Aegean Sea 19; Central Mediterranean 108; Iberia 128 sites). The dataset includes pieces from direct study, 701 bracelets (Turkey 95; Greece 38; Italy 151; Iberia 417 pieces) with measurements, raw material, and typological information, and other pieces deriving from previously published data. Regarding Greece, the limited typological and raw material information on the stone bracelets known bibliographically has led us to omit this data from the final statistical analysis, at least at this stage of research. All bracelets were considered regarding their spatial distribution; however, only the direct studies are used for the morphological and typological comparisons.

The quantitative variables considered for the morphological comparisons are height, thickness, and internal and external diameter. In the case of fragments of bracelets, which constitute the vast majority of the pieces studied, the diameters have been reconstructed with trigonometric calculations, starting from the preserved segment of the circle.

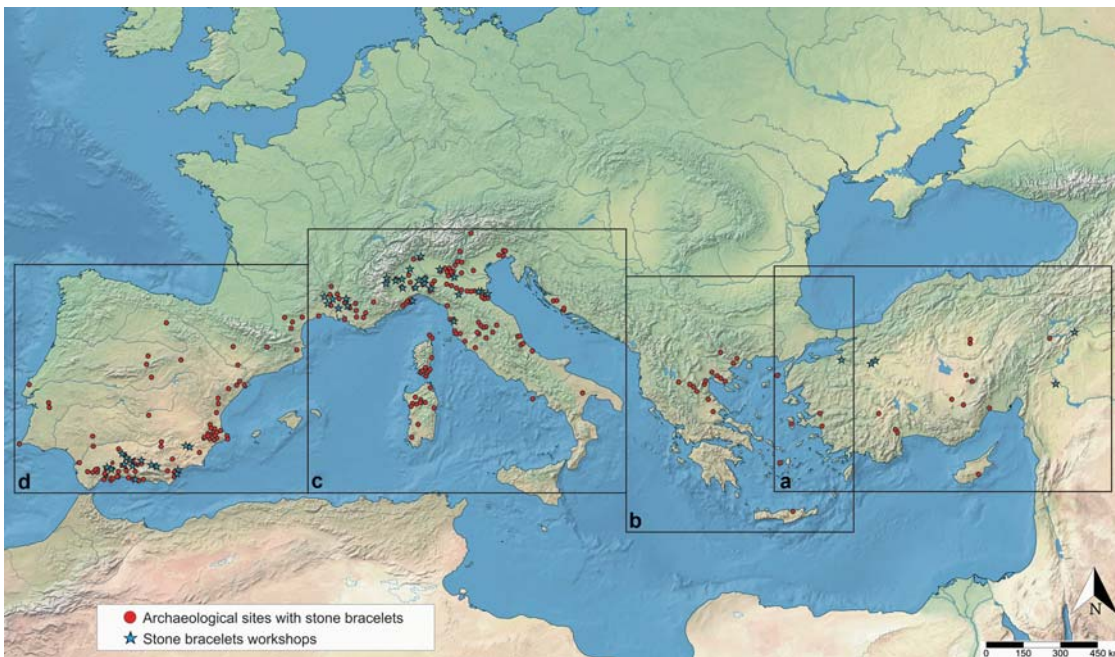


Figure 1: General map of Neolithic stone bracelets around the Mediterranean Sea and delimitation of different study areas: (a) Fertile Crescent and Turkey; (b) the Aegean Sea; (c) Central Mediterranean; and (d) the Iberian Peninsula. All the maps have been made using SimpleMappr (Shorthouse, 2010).

The identification of raw materials has been mainly made through naked eye observation. The stone bracelets' lithologies are both extremely varied and complex. Therefore, the nature of the rock formation was used to classify two broad lithological groups: metamorphic rocks with different grades of metamorphoses (shales, schists, marbles, serpentinite, amphibolite, jadeitite, etc.) and sedimentary rocks without metamorphism (broad sense limestones). We have also considered the available determinations using petrology methods made both by us and other researchers (thin sections, X-ray diffraction, and X-ray fluorescence).

The chronological attributions have been made using the stratigraphic contexts with absolute dates in which the ornaments appear. However, given the reduced number of bracelets associated with well-dated stratigraphic contexts with radiocarbon dates, chrono-cultural assignation by material culture has been used for some archaeological sites and areas.

3 From East to West. An Overview of Stone Bracelets in the Mediterranean

3.1 Fertile Crescent and Turkey

In their study of Neolithic material culture, Kozłowski and Aurenche (2005, pp. 194–197) identified the distribution of bracelet types across the Fertile Crescent, showing that their earliest use encompassed the Levant, Mesopotamia, and southeast Turkey. In the Levant, among the many bracelets, some notable examples are the household production of sandstone rings of various sizes of the late 8th millennium BC at Ba'ja (Gebel & Bienert, 1997, p. 252), production at Basta where a wider variety of materials was used including a kind of plaster (Starck, 1988, p. 138) and 'Ain Ghazal and Wadi Shueib where local materials were exploited (Al Nahar, 2014). Hundreds of broken limestone rings of various colors used as bracelets or

armlets, some with grooved profiles, are reported from late 8th to early 7th millennium BC Motza, along with some examples made of shell. The artifacts were produced at the site (Vardi, Yegorov, & Khalaili, 2020, pp. 111–114). It is likely that there was wider distribution in the region given the imported sandstone examples at Rabud (Gubenko, Barzilai, & Hamoudi, 2009, p. 77) and a mixture of imported and local items at Ashkelon (Garfinkel & Dag, 2008, pp. 189–190).

The earliest known use of single-piece stone bracelets in Turkey comes from the southeast where evidence for bracelet production is associated with the earliest Neolithic settlements. At Çayönü, hundreds of bracelets of simple round/oval and complex ridged profiles were made, mostly from white limestone, from the PPNA (around 10000 cal. BC) onwards. PPNB graves show use of bracelets on the arm (Kodaş & Erdoğan, 2018; Kodaş, Genç, Labedan-Kodaş, İpek, & Erdoğan, 2019). The ridged profile is first recorded in PPNB levels (9th–8th millennium cal BC) and is probably part of a wider regional practice attested at Cafer Höyük (Erim-Özdoğan, 2011; Maréchal, 1985; Özdoğan, 1994). These early examples are of good quality, showing developed techniques. A fragment of ridged profile obsidian bracelet from Aşıklı Höyük (8th millennium BC) demonstrates early skill in working hard materials (Astruc *et al.*, 2011).

Workshop areas under light shelters outside the houses at Çayönü indicate a range of differentiated specialized activities including bracelet manufacture (Özdoğan, 1994). At Cafer Höyük, the skill seen in the production of bracelets of the 7th millennium BC made of polished marble (ridged) and basalt (round/oval) (Maréchal, 1985), rather than the number of examples, indicates skilled production. The tradition is long continuing in the 7th–6th millennia at Akarçay Tepe (Özbaşaran & Duru, 2011) and Mezraa Teleilat (M. Özdoğan pers. comm.).

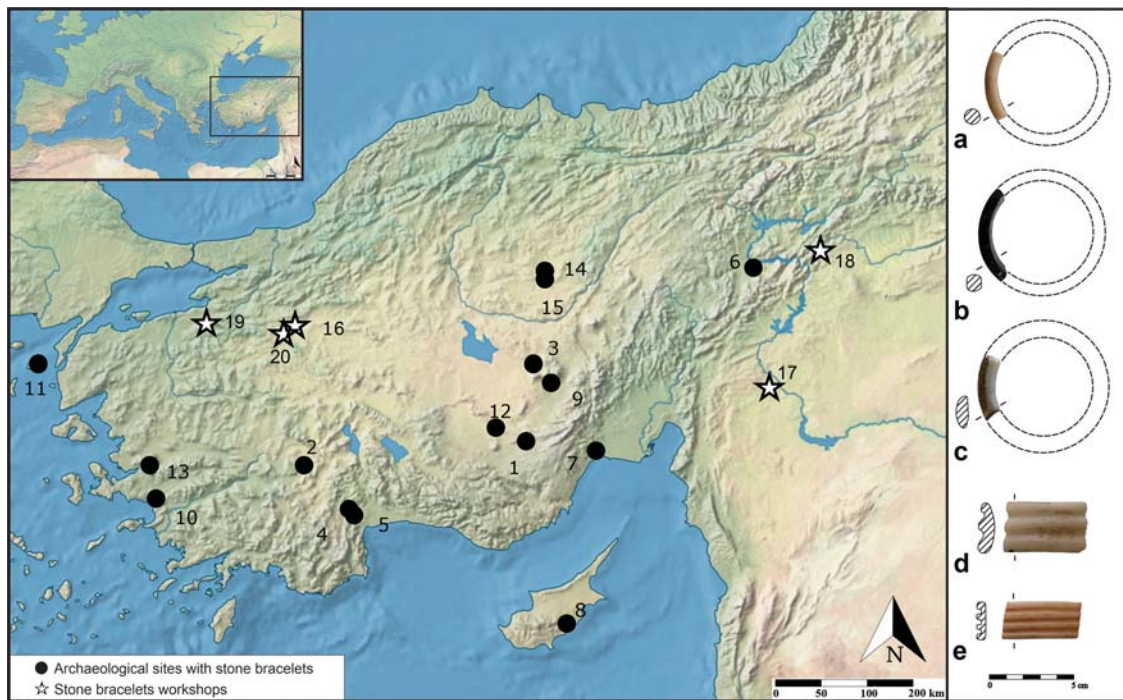


Figure 2: Stone bracelet distributions in Turkey: (1) Canhasan I (Alaçatı, Karaman); (2) Hacılar (Hacılar, Burdur); (3) Aşıklı Höyük (Kızılkaya, Aksaray); (4) Suluin (Döşemealtı, Antalya); (5) Karain (Döşemealtı, Antalya); (6) Cafer Höyük (Battalgazi, Malatya); (7) Yumuktepe (Merkez, Mersin); (8) Khirikitia (Larnaca, Cyprus); (9) Köşk Höyük (Bağçeli, Niğde); (10) Çukuriçi Höyük (Selçuk, İzmir); (11) Uğurlu (Gökçeada, Çanakkale); (12) Çatalhöyük (Çumra, Konya); (13) Ulucak (Kemalpaşa, İzmir); (14) Büyükkaya (Boğazkale, Çorum); (15) Yarıkkaya (Boğazkale, Çorum); (16) Orman Fidanlığı (Merkez, Eskişehir); (17) Mezraa Teleilat (Mezraa, Şanlıurfa); (18) Çayönü (Sesverenpınar, Diyarbakır); (19) Aktopraklık (Nilüfer, Bursa); (20) Kanlıtaş (İnönü, Eskişehir). Stone bracelet variability: (a) marble from Canhasan, Alaçatı, Karaman; (b) schist narrow bracelet with square cross-section from Yumuktepe, Merkez, Mersin (courtesy of Isabella Caneva); (c) marble bracelet with oval/D-shaped cross-section, Yumuktepe (courtesy of Isabella Caneva); (d) marble ridged bracelet from Canhasan; and (e) marble multi-ridged bracelet from Canhasan.

With time, the production and use of stone bracelets spread toward the west and northwest, across the Anatolian peninsula, and by the 6th millennium BC, bracelets are recorded across Turkey (Figure 2). The data relating to this process is patchy, examples from intermediate areas including Yumuktepe, Canhasan (French, 2010), and Büyükkaya (Schoop, 2005) suggest wide distribution in the Chalcolithic (6th–4th millennia BC).

The bracelets in central and western Anatolia were predominantly made of white marble and can be associated with the exploitation of marble sources for a variety of craft activities, including the production of vessels and figurines. The Chalcolithic saw regional specializations in north-western Anatolia in the intensive exploitation of local white marble sources. The sites of Orman Fidanlığı (Ay-Efe, 2001) and Kanlıtaş (Baysal et al., 2015) had production sequences of bracelets with both simple and ridged profiles and evidence through wasters of relatively high-volume production, probably for wider distribution. At Aktopraklık, round profile bracelets were made in large numbers, alongside an intensive disc bead industry (Karul & Avcı, 2013; Karul, 2017). Evidence from other sites of this period is more ephemeral, with fragments of white marble bracelets often being part of Chalcolithic (6000–3000 cal. BC) ornament assemblages, but in low numbers (Dikaios, 1953; Erdoğu & Çevik, 2020; Erdoğu, 2013; Horejs et al., 2015; Mellaart, 1970; Öztan, 2012; Schoop, 2005; Seeher, 1987; Ünlüsoy, 2002). The somewhat larger and more complex assemblage of fragments from Canhasan I in Central Anatolia (second half of 6th millennium BC) (French, 2010) shows that all profiles from round to multiple-ridged were also present in this region in the Chalcolithic.

The use of stone bracelets takes around 2000 years to spread from eastern to western Turkey, spanning the Pre-Pottery and Pottery Neolithic periods and continuing into the Chalcolithic. While there is most evidence for the round profile from at least the 9th millennium onwards, complex profiles are consistently, if infrequently, present from the 8th millennium BC. From the PPNA onwards, starting in the Levant and southeast Anatolia and apparently moving gradually west, broken bracelets, usually of simple profile, were perforated and re-used (for example, at Motza, Vardi et al. 2020, p. 113; Ashkelon, Garfinkel & Dag 2008, p. 190). It has been suggested that this was a deliberately repeated process (Erim-Özdoğan, 2011). The degree of temporal and spatial dispersion of this practice suggests that it had a shared meaning. Previous summaries have described bracelets' role in the 'Neolithic package' of items and practices that were moved through time across the Anatolian peninsula and into the Aegean and Europe (Çilingiroğlu, 2005). The mechanisms by which bracelet-related practices transitioned from eastern to western Turkey, and the degree to which they were related, in this region, to the movement of farming communities or the uptake of practices associated with farming, are not yet well understood.

3.2 The Aegean Sea

Personal ornament production and use in Neolithic Greece (Ifantidis, 2019; Kyparissi-Apostolika, 2001; Miller, 1997) is characterized by the following: (a) a chronologically gradual density of finds (regarding, of course, those that are made of durable materials) during the Aegean Late Neolithic (5400/5300–4600/4500 cal. BC), (b) a multitude of types, raw materials, and *chaînes opératoires* used for jewelry manufacture emanating in the initial stages of the Neolithic, and (c) the prevalence of specific ornaments, such as the *Spondylus gaederopus* shell bracelets, the local Aegean production and diffusion of which is attested throughout the Balkans and Europe (Ifantidis & Nikolaidou, 2011).

Although stone, and especially marble, was used from the Aegean Early Neolithic period (ca. 6700/6500–5800/5600 cal. BC), in small quantities, in vase-carving, bead and pendant-making, stone bracelets are extremely rare finds. The earliest examples come from Early Neolithic Knossos (Evans, 1964), but the greatest density (Figure 3) is attested in Northern Greece deriving from Aegean Middle and Late Neolithic contexts (ca. 5800/5600–4700/4500 cal. BC).

All of the bracelets are fragmented and found in settlements, with only one known exception of a bracelet placed in a burial context (from Kremasti: Chondrogianni-Metoki, 2009), while no workshop has yet been identified. Since most of these bracelet fragments (ca. 120) are not fully published, the data on the chronological, morphological, and contextual characteristics are limited for each site assemblage.



Figure 3: Stone bracelet distribution in the Aegean: (1) Promachonas (Serres-C. Macedonia); (2) Sitagroï (Drama-E. Macedonia); (3) Dimitra (Serres-C. Macedonia); (4) Thermi (Thessaloniki-C. Macedonia); (5) Vasilika (Thessaloniki-C. Macedonia); (6) Vasilika-Kyparissi (Thessaloniki-C. Macedonia); (7) Olynthus (Chalkidiki-C. Macedonia); (8) Stavroupoli (Thessaloniki-C. Macedonia); (9) Makrygialos (Pieria-C. Macedonia); (10) Kato Agiannis (Pieria-C. Macedonia); (11) Dispilio (Kastoria-W. Macedonia); (12) Kleitos (Kozani-W. Macedonia); (13) Kremasti (Kozani-W. Macedonia); (14) Servia (Kozani-W. Macedonia); (15) Rachmani (Larissa-Thessaly); (16) Tsangli (Larissa-Thessaly); (17) Agio Galas (Chios island-N. Aegean); (18) Saliagos islet (Antiparos island-Cyclades); (19) Knossos (Heraklion-Crete). Stone bracelet variability: (a) large opal (?) bracelet found in a burial context, probably imitating large *Spondylus* bracelets, from Kremasti; (b) ridged and perforated marble repaired bracelet from Dispilio; (c) the most intact preserved stone bracelet in Neolithic Greece from Dispilio, found fragmented due to repeated repair actions; and (d) marble bracelet fragments from Promachon.

Nevertheless, the majority of the annulets seem to have been manufactured from mostly white or gray marble with round, semi-circular, or square profiles, while few examples have ridged profiles. Regarding their use, most of the annulets are large enough to be used as bracelets. While all of the material is fragmented, and no production site has been identified, repair and re-use practices are usually recorded (Dispilio: Ifantidis, 2019; Stavroupoli: Grammenos & Kotsos, 2002), for example, the re-joining of the bracelet fragments or their alteration into pendants and/or beads.

The largest published corpus of stone bracelets in Neolithic Greece (ca. 38) comes from Aegean Middle/Late Neolithic Dispilio (Ifantidis, 2019) where these intense re-use practices are known. A possible hoarding practice of broken annulets has been recognized, indicating their special value as “exotic” artifacts, since the raw material provenance is the Cycladic islands (Ifantidis & Papageorgiou, 2011). Along with the Dispilio assemblage, Late Neolithic Kleitos (Ziota, 2011) and Promachon (Palaiologou, 2007) – also in Northern Greece – are the sites where most of the stone bracelets have been found (although in both cases not fully published).

The predominance of bracelets made of the locally acquired *Spondylus gaederopus* (and *Glycymeris* sp.) seashells in Neolithic Greece (from the Aegean Middle/Late Neolithic), as reflected by a plethora of data (evidence for production sites and a large distribution of finds throughout the mainland and the islands)

may be the main reason for the limited stone bracelet production, for which the information is scarce, especially regarding their *chaîne opératoire*. However, the indications that the marble used for the bracelets found at Dispilio, and perhaps from other Northern Greek sites, is of Cycladic origin (e.g., the archaeometric study of marble finds on the island of Thasos: Maniatis et al., 2009), may express the possibility of the existence of an exchange network parallel to the *Spondylus*, either of raw material or finished products, via the Cyclades and/or Anatolia. Further archaeometric analysis, along with the correlation of data from Anatolian sites, such as Uğurlu (Erdoğu, 2013; Erdoğu & Çevik, 2020), where both marble and *Spondylus* bracelets are found, may shed light on these possible networks.

3.3 The Central Mediterranean

The spreading of stone bracelets in Italy involves several Neolithic groups. Their distribution is very wide (Figure 4), especially in the northern regions, indicating that the employment of such ornaments was transcultural and had a long-lasting tradition as an important component of Neolithic costume (Micheli, 2012b). The stone ring bracelet is characteristic of, and seemingly exclusive to, all groups of the Early Neolithic of the Po Plain and surrounding Alpine territories (mainly Fiorano, Vhò, and Friulian groups, less common but attested also in Isolino and Gaban groups) and of Neolithic communities related to them such as the Incised Lines Pottery culture in central Italy. Only in Liguria, stone bracelets appear during the Epicardial or in the older phase of the Square Mouthed Pottery (Vasi a Bocca Quadrata) culture of the Middle Neolithic, while they are not present in the Impresso-Cardial Complex sites. In Sardinia, they appear in late Early Neolithic and/or Middle Neolithic sites, mainly within the Bonu Ighinu culture. In central Italy, rings are attested during the Middle Neolithic in the Bichromatic and Trichromatic Painted Pottery groups and Serra d'Alto culture (Micheli, 2012b; Pessina, 1998; Ribero, 2017; Tanda, 1977; Traversone, 1996). In southern France, stone bracelets appear in diverse cultural groups and chronological phases: in fact, their use seems to continue throughout the Neolithic and perhaps even later. Rings are more abundant east of the Rhone in Provence than in the west in Languedoc. In Corsica, stone bracelets are attested in the Middle Neolithic and also in later contexts (Courtin & Guthertz, 1976; Courtin, 2000, pp. 95–97). Along the eastern Adriatic coast, rings are instead very rare: in central Dalmatia, only four sites of the Danilo culture, dated to the Middle Neolithic, provided stone specimens of an apparent Italian style (Micheli, 2014).

Unfortunately, many Italian stone bracelets come from the surface or very old collections (Tanda, 1977; Traversone, 1996); nonetheless, their attribution to the Early Neolithic is probable due to some recent discoveries in well-dated settlements where there is no evidence of other Neolithic phases (Angeli, in press; Micheli, 2018; Pessina & D'Amico, 1999, pp. 70–72; Ribero, 2017; Starnini, D'Amico, Biagi, Ghedini, & Pitti, 2004, pp. 569–575; Starnini, Biagi, & Mazzucco, 2018). In fact, although stone rings are attested in the early phase of the Square Mouthed Pottery culture in Liguria, they have never been found in any graves of the same groups of the Po Plain, where instead other ornaments are very common (Micheli, 2012a).

The most common bracelets in Italy have a circular, subcircular, or oval form and a triangular or drop-shaped section in their width (Tanda, 1977, p. 112) and their use seems permanent once worn on the arm. Composed bracelets formed from perforated segments joined together by string are also known; they may have been used later in re-employment after bracelet breakage or as pendants. Nevertheless, composed bracelets do not seem to be exclusively the result of repair and might be considered as a diverse type that could be affixed and removed easily (Micheli, 2012b, p. 243).

In northern Italy, bracelets were numerous and mainly obtained from metamorphic rocks of the greenstone group, which includes serpentinite, paragonite-schist, mica-schist, and chlorite-schist, although sedimentary and effusive rocks were also employed less frequently. Other harder and stronger greenstones such as eclogite and jadeitite were also occasionally used for bracelets, but their main use was reserved for cutting tools such as axes or chisels (Micheli, 2012b, 2018; Pessina, 1998; Ribero, 2017; Tanda, 1977). Greenstone rings also spread in France from the Cardial phase, but their incidence was not significant at least during the early Neolithic when limestone and/or marble specimens were preferred. Greenstone

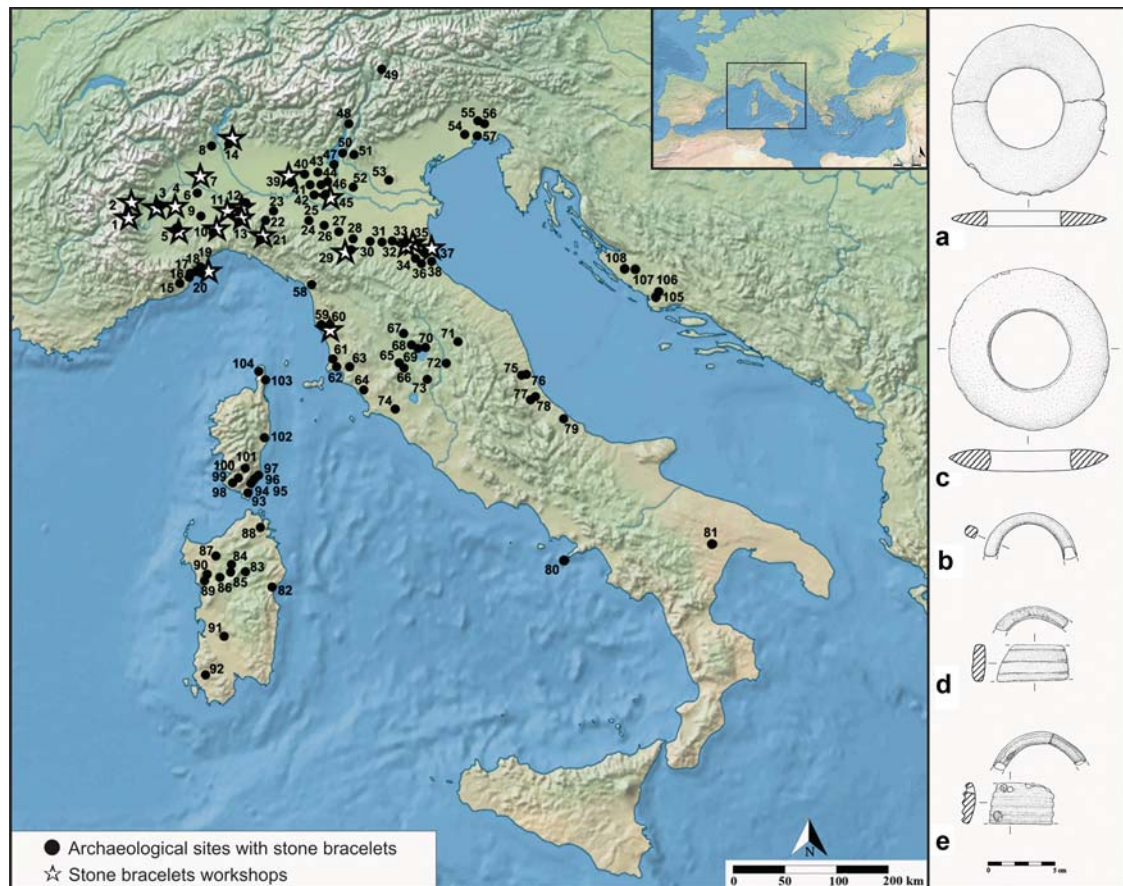


Figure 4: Stone bracelet distribution in Central Mediterranean: (1) Monviso (Colle dal Vallone, Pra Fiorito, Alpetto, Punta Murel, Rocca del Lu, Col del Lu, Corn de Jasses, Alp Bulé); (2) Monte Orsiera - Seleiraut and Balm'Chanto; (3) Torino and Carignano; (4) Chieri; (5) Alba (Regione Borgo and Cooperativa Lavoratori); (6) Mombello Monferrato; (7) Carisio; (8) Rocca Boromea; (9) Villa del Foro; (10) Pieve, Novi Ligure; (11) Biagasco-Cimitero, Pozzol Groppo; (12) Momperone-Rio Carona; (13) Brignano Frascata; (14) Palude Brabbia; (15) Arma di Nasino; (16) Caverna delle Paste, Toirano (17) Caverna Pollera; (18) Caverna dell'Acqua; (19) Caverna dei Pippistrelli; (20) Caverna delle Arene Candide; (21) Bobbio; (22) Sant'Andrea di Travo; (23) Casa Gazza, Travo; (24) Cascina Marana, San Ruffino; (25) Cascina Catena, Gaione; (26) Salerno; (27) Albinea; (28) Fornaci Carani-Cava Est, Fiorano Modenese; (29) Pescale, Prignano sul Secchia; (30) Savignano sul Panaro; (31) Bellaria, Bazzano; (32) Bologna; (33) San Lazzaro di Savena (Idice - Villa Bignami and Ponticella - Podere Sant'Andrea); (34) Prunaro - Massa Rapi, Ozzano; (35) Castel San Pietro Terme; (36) Podere Rossola, S. Prospero - Imola; (37) Fornace Gattelli, Lugo di Romagna; (38) Riolo Terme, via Ripa; (39) Sergnano; (40) Torriani, Camisano; (41) Pratzigani di Sotto, Romanengo; (42) Castelleone; (43) Cascina Ferramonde di sotto, Bagnolo Mella; (44) Ostiano (Casotte and Dugali Alti); (45) Vhò di Piadena (Campo Ceresole, Campo Costiere, Campo Sera Mattina and Cascina Ronchi di San Lorenzo Guazzone); (46) Cascina Bocche, Isorella; (47) Lugana Vecchia, Sirmione; (48) Riparo di Moletta Patone di Arco; (49) Plunacker, Villandro/Villanders; (50) Rocca di Rivoli Veronese; (51) Lugo di Grezzana; (52) Scolo Gelmina, Gazzo Veronese; (53) Le Basse di Valcalaona; (54) Valer, Azzano Decimo; (55) Sammardenchia-Cueis, Pozzuolo del Friuli; (56) Buttrio; (57) Bonifica, Muzzana del Turgnano; (58) Grotta all'Onda, Camaiore; (59) Condotti Vecchi, Livorno; (60) Casa Querciolaia, Livorno; (61) Paduletto B, Castagnetto Carducci; (62) Affitti Gotti, Campiglia Marittima; (63) Massa Marittima (Cura Vecchia e Vallone il Poggio); (64) Buca di Spacasasso di Alberese; (65) Grotta dell'Orso di Sarteano; (66) Grotta Lattaia, Cetona; (67) Arezzo; (68) Terontola; (69) Borghetto sul lago Trasimeno; (70) Tuoro sul Trasimeno; (71) Sigillo; (72) Bettona; (73) Tane del Diavolo, Parrano; (74) Poggio Olivastro, Canino; (75) Valle della Vibrata; (76) Ripoli; (77) Ponte Rosso, Catignano; (78) Villa Badessa, Cepagatti; (79) Fossacesia; (80) Grotta delle Felci, Capri; (81) Picciano, Malvezzi; (82) Santu Basile, Dorgali; (83) Grotta Bariles, Ozieri; (84) Sa Binza Manna, Plogaghe; (85) Monte Maggiore, Thiesi; (86) Sa Rocca Ulàri, San Pietro di Sorres; (87) Monte d'Accodi; (88) Liscia Pirastru, Arzachena; (89) Grotta di Filiestru di Mara, Bonu Ighinu; (90) Sa Ucca de su Tintirriolu, Mara; (91) Sa Domu 'e s'Orcu di Siddi; (92) Colle della Nostra Signora del Buon Cammino, Iglesias; (93) Parmentile (Corsica); (94) Tivulaghju (Corsica); (95) Abri Cap Saint-Cyprien, Porto Vecchio (Corsica); (96) I Caselli, Porto Vecchio (Corsica); (97) Tozze Bianche, Porto Vecchio (Corsica); (98) La Punta, Sartène (Corsica); (99) Castidacciu, Sartène (Corsica); (100) Pastini, Foce (Corsica); (101) Abri I - Curacchiaghju, Levie (Corsica); (102) Terrina IV, Aléria (Corsica); (103) Abri Torre d'Aquila, Pietracorbara

(Corsica); (104) A Guaita, Morsiglia (Corsica); (105) Danilo (Croatia); (106) Pokrovnik (Croatia); (107) Smilčić-Barice (Croatia); (108) Benkovac-Barice (Croatia). Stone bracelet variability: (a) paragonitic micaschist triangular cross-sections bracelet from Sammardenchia (Udine); (b) limestone triangular cross-sections bracelet from Caverna Pollera (Finale Ligure, Savona); (c) limestone narrow bracelets with circular-flat cross-section from Caverna Pollera; (d) marble decorated bracelets from Caverna Pollera; and (e) marly limestone multi ridged bracelet from Caverna delle Arene Candide (Finale Ligure, Savona).

bracelets are generally low-profiled objects with a wide crown, while a band-like rings made of limestone or marble, very rare in Italy, are common in southern France (Courtin & Gutherz, 1976) and in other Mediterranean regions. Thus, it follows that there was a direct relationship between the section shape of rings and the geological characteristics of the stone employed to make them.

Manufacturing remains of greenstone rings are attested in northern Italy in sites located in the plains with secondary Oligocene conglomerate deposits. The remains comprise discoid artifacts, rough-outs, and unfinished bracelets; manufacturing of rings is documented at the same site where stone axe production is also attested (Angeli, in press; Faudino & Tiberio, 2011; Micheli, 2012b; Pessina & D'Amico, 1999; Starnini et al., 2004). Such evidence testifies to a form of specialized craft not based exclusively on the manufacturing of a characteristic type or class of artifacts, but rather on the transformation of a specific raw material that needed particular skill and knowledge. Recent research has revealed manufacturing evidence of axe and ring bracelet production *in situ* at high altitude in some locations in the Monviso and Monte Orsiera areas in the western Alps in correspondence to primary outcrops of the metamorphic rocks serpentinite, mica-schist, and chlorite-schist used for the ornaments (Pétrequin, Pétrequin, Errera, & Prodéo, 2012). This production, confirmed from at least 5300 cal. BC onward, may have started even earlier. The preference for green stones was not accidental since they have a very fine color, aesthetic qualities, and some are not difficult to work (Pétrequin et al., 2019). On the basis of proximity to the primary or secondary sources of the greenstones available in north-western Italy, we observe differences in the incidence of the stones employed for bracelets among the various northern Neolithic groups as the distance increases moving from west to east (Micheli, 2012b, p. 245, Figure 4).

3.4 Iberian Peninsula

Researchers of the Neolithic period in Iberia have interpreted stone bracelets as chronocultural markers, elements of exchange and objects with a high social value (Gavilán Ceballos & Rafael Penco, 1999; Harrison & Orozco Köhler, 2001; Martínez-Sevilla, 2018, 2019; Noain Maura, 1996; Orozco-Köhler, 2016; Pascual Benito, 1998; Rubio De Miguel, 1993). The traditional typology in this area comprises both narrow and wide bracelets, with or without incised parallel lines (Teruel Berbel, 1986). This is a general classification, but the typology is more complex and diverse. Thus, recent research has taken into account several features (morphometry, cross-sections, raw materials, and decoration) and has been able to establish four types of stone bracelets (Martínez-Sevilla, 2018, p. 226) (Figure 5).

The lithologies used to make stone bracelets in Iberia are varied, marble and limestone being the most frequent, and foliated rocks like slate and schist the least used. The typology is intrinsically related to the chosen rock. Narrow bracelets are made in slate/schist, limestone, and marble, while medium and wide bracelets are elaborated in marble or limestone. There is a strong prevalence in the use of marble for wide examples, this being the raw material exclusively chosen for decorated bracelets.

Stone bracelets are distributed in different areas of Iberia, but there is a clear concentration in the coastal areas and nearby territories. This distribution is coincident with the zones where the first production economy appears. Analyses of the geographical distributions of finished bracelets and workshops have shown the existence of two large cultural groups which probably developed independently. These groups include the areas of Andalusia (broadly the south of Iberia) and the Levant of the Iberian Peninsula (Martínez-Sevilla, 2019). Although there are stone bracelets in other areas of Iberia, they are less representative in terms of quantity, but their chronology is also Early Neolithic. In the main areas with stone bracelet concentrations, they appear at the same time as the arrival of the farming economy and are probably associated

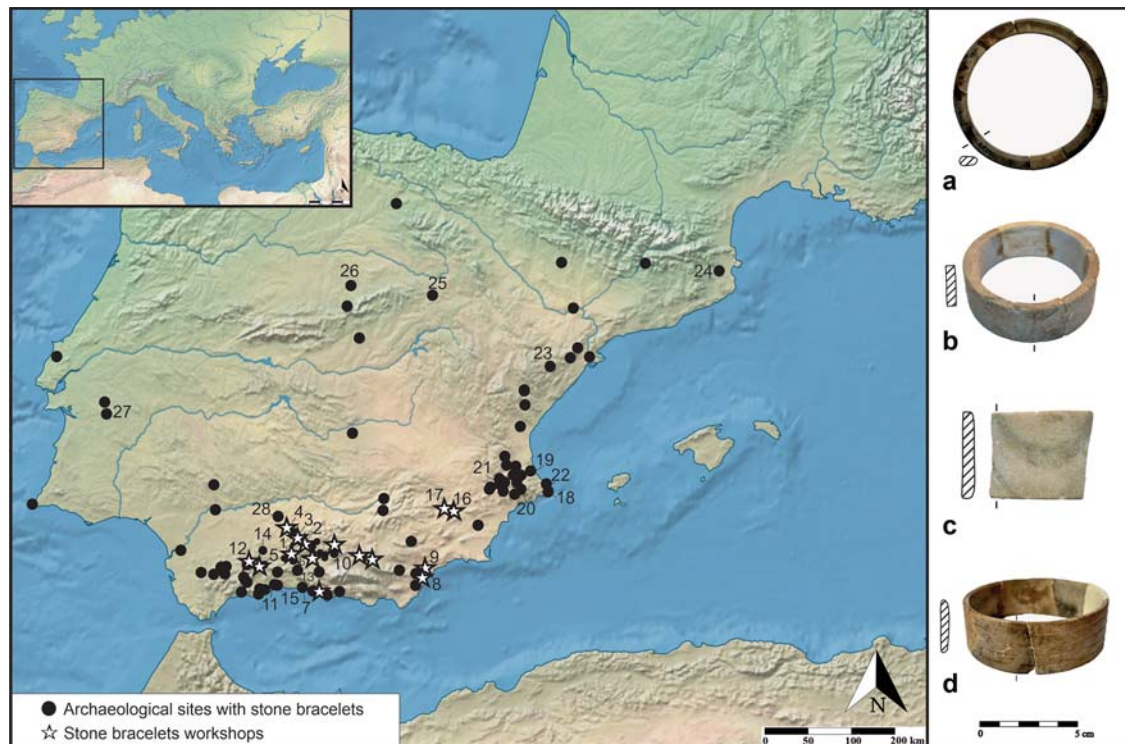


Figure 5: Location of the main archaeological sites with stone bracelets in the Iberian Peninsula: (1) Cortijo Cevico (Loja-Granada); (2) Los Castillejos (Montefrío-Granada); (3) Cueva de Los Mármoles (Priego de Córdoba-Córdoba); (4) Cueva de los Murciélagos (Zuheros-Córdoba); (5) Cueva del Toro (Antequera-Málaga); (6) Cueva de la Mujer (Alhama-Granada); (7) Cueva de Nerja (Maro- Málaga); (8) Cabecicos Negros (Vera-Almería); (9) Cerro Virtud (Cuevas de Almanzora-Almería); (10) Cueva del Agua (Prado Negro-Granada); (11) Cueva del Calamorro (Benalmádena-Málaga); (12) Cueva de la Pulsera (Antequera-Málaga); (13) Hoyo de la Mina (La Araña-Málaga); (14) Cueva de la Solapilla (Mollina-Málaga); (15) Cueva de los Botijos (Benalmádena-Málaga); (16) Cueva de La Serreta (Cieza-Murcia); (17) Abrigos del Pozo (Calasparra-Murcia); (18) Cova de Les Cendres (Teulada- Alicante); (19) Cova de l'Or (Beniarrés-Alicante); (20) Benamer (Muro-Alicante); (21) Cova de la Sarsa (Bocairent-Valencia); (22) Cova Ampla del Montgó (Xàbia-Alicante); (23) Cova Fosca (Ares del Mestre-Castellón); (24) La Draga (Banyoles-Girona); (25) La Revilla del Campo (Ambrona-Soria); (26) Cueva de La Vaquera (Torreiglesias-Madrid); (27) Valada do Mato (Évora-Portugal); (28) Castillo de Doña Mencía (Córdoba). Stone bracelet variability: (a) limestone narrow bracelet from Cueva del Agua, Prado Negro-Granada; (b) limestone medium bracelet from Cueva del Agua, Prado Negro-Granada; (c) marble wide bracelet from Cueva de la Carigüela, Piñar-Granada; and (d) marble decorated bracelet from Cueva de Nerja, Maro-Málaga.

with Cardial pottery decoration (Carrasco Rus & Martínez-Sevilla, 2014; Carrasco Rus, Morgado, & Martínez-Sevilla, 2016; Martín-Socas, Camalich Massieu, Caro Herrero, & Rodríguez-Santos, 2018).

Of the 26 workshops documented so far, 24 are situated in Andalusia, there are only two located in the “cultural border” between Andalusia and the Iberian Levant area – Los Abrigos del Pozo (Martínez Sánchez, 1994) and the cave of La Serreta (Martínez-Sevilla & Salmerón Juan, 2014). The production remains were mainly cataloged in open-air settlements, and the rest come from seasonally occupied caves. The raw material used in the workshops is always local. The sources are primary materials extracted from geological outcrops and pebbles from riverbeds. The discovery and study of the Cortijo Cevico quarry, where there was no bracelet production, has shown that workshops were not only located at outcrops (Martínez-Sevilla, Carrasco Rus, Lozano Rodríguez, Jiménez Cobos, & Gutiérrez Rodríguez, 2018). At the workshops, the bracelets made from exotic rocks are finished objects with evidence of wear. Bracelet production can be interpreted as mainly a domestic craft in the Andalusia region, with groups established in different areas manufacturing bracelets in local lithologies. This does not mean that the production of bracelets is not specialized. Indeed, where the necessary skills exist to make bracelets, their production is common. Thus, individuals were wearing bracelets made by their group and others made by other

communities in exotic rocks and with exceptional finishes reflecting specialized craftsmanship (Martínez-Sevilla & Salmerón Juan, 2014; Martínez-Sevilla, 2010).

In Iberia, the stone bracelets are documented in a broad variety of archaeological sites from settlements to burials. These ornaments were used as personal decorations but also as elements of cultural identification. The use of stone bracelets in Iberia has been determined by the association of radiocarbon dates and bracelets' stratigraphic locations. This shows that their manufacture and use spans from c. 5500 to 4800 cal. BC (Martínez-Sevilla, 2019). There is no evidence of stone bracelets production in the Middle Neolithic (c. 4800–4200 cal. BC) or the Late Neolithic (c. 4200–3000 cal. BC) when the first megalithic constructions appear. The disappearance of stone bracelets from the Neolithic assemblages coincides with a cultural change in the first farming communities in southern Iberia.

According to the quantitative and spatial distributions of bracelets and workshops, these ornaments are characteristic of the first Neolithic groups from Andalusia. The definition of the two large cultural areas, Andalusia and the Iberian Levant, is not only based on stone bracelets, but also on other archaeological evidence that supports this distinction, such as rock art, pottery decoration, or cannibalism. In this sense, the majority of the bracelets that appear in the Iberian Levant would have arrived in this zone by exchange systems, evidenced by the absence of workshops and the greater value of the bracelets, based on their high degree of use and numbers of repairs/reuses (Martínez-Sevilla, 2019).

4 Discussion

The morphology of the profile of stone rings changes dependent on the relationship between height and thickness, which are directly correlated. The comparison of the 566 stone ring measurements shows morphological variations in the different geographical areas (Figure 6). While the shapes of the rings analyzed show similarity in the three areas with data, the highest variation in the size distribution is among the objects from north Italy. There is a clear correlation between the stone rings from Turkey and Iberia that can probably also be extended to the examples from Greece.

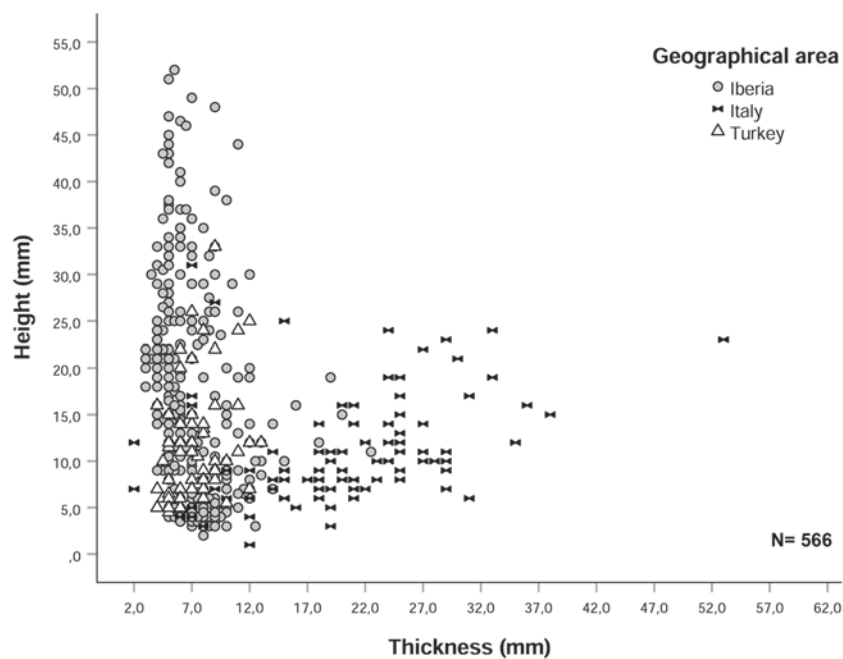


Figure 6: Relationship between height and thickness of stone bracelets from the three areas with measurements.

The most common type is thin annulets (between 2 and 12 mm) and a variation of height from 2 to 50 mm. The other measurement that gives an idea about the morphology is the correlation between the internal and external diameter. The typology is varied in the areas studied here, but in general, the pieces share standard cross-sections (circular, square, rectangular, or triangular). One type that extends across all the regions, in different percentages, is the ridged bracelets, including those decorated with parallel incised lines. As can be seen in Figure 7, the Italian pieces are relatively different in comparison with the other regions, with Italian examples having a greater thickness and smaller height. These are the typical bracelets with triangular or drop cross-sections made from green stones (Micheli, 2012b).

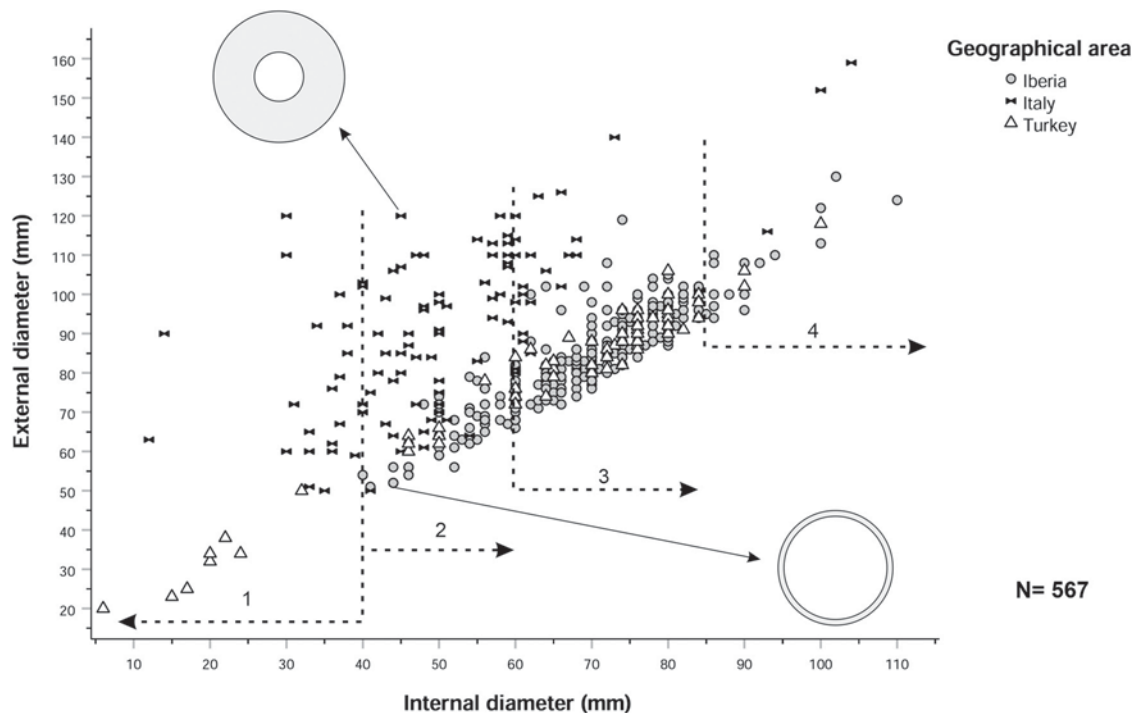


Figure 7: Internal and external diameters of the ring-shaped ornaments from the three study areas with measurement information. Typological classification considering the inner diameter: (1) very small to be bracelets (5–40 mm); (2) small (40–60 mm); (3) medium (60–85 mm); and (4) large (85–110 mm). Observe how the morphology changes with the relation between the internal and external diameters.

The raw material used to make stone bracelets is very varied both within each area and across the whole study region. The most commonly used stones are white marble or limestone in Turkey, Greece, the south of France, and the Iberian Peninsula. However, bracelets in metamorphic rock such as slate, schist, or the green alpine rocks (jadeitite, omphacite, eclogite, serpentinite, greenschist, and amphibolite) are also common. The use of stones is related both to aesthetic choices and to the technological processes involved in production. There is a clear predominance of the colors white and gray in Turkey, Greece, and Iberia, while in other regions, green or black were more often chosen, as in central-north Italy.

One of the most challenging questions about these ornaments is determining the function of these ring-shaped objects. Normally, researchers have classified them according to the internal diameter; the small ones as rings, and the ones with a diameter larger than a finger have been interpreted as bracelets. In our dataset, the majority of the pieces have internal dimensions that mean they could be worn over the hand by adults or children. However, there is a set of artifacts that are too small to be worn over the hand even by children (Figure 7: 1).

The use of these annular objects can be interpreted using three complementary types of evidence:

- (1) The association of annulets within burials with a particular position on the individual. Unfortunately, many stone bracelets from our studied areas come from settlement sites, surface collections, or very old assemblages. Even so, there are some stone bracelets associated with burial contexts in the

Mediterranean area. At Boncuklu Tarla in south-eastern Turkey, round-profiled marble annulets perforated at four places around their periphery found in the pelvis area in burials may have been used as belt buckles, although large enough to be small bracelets (Middle-Late PPNB, 8th–7th millennia BC, Kodaş, 2019, pp. 11–12). At Çatalhöyük in central Turkey round profile, bracelets were worn on the arms of individuals buried under house floors (Pottery Neolithic, 7th millennium BC, Vasić, 2020, pp. 72–75). There is one bracelet placed in a burial context in Greece (Chondrogianni-Metoki, 2009). Likewise, there is a grave in Murciélagos de Zuheros cave in Iberia with a male individual wearing a marble bracelet on his forearm, this burial belongs to the Early Neolithic (wk-40844: 6226 ± 20 BP; 5296–5076 cal. BC 2σ) (Valdiosera et al., 2018). The lack of examples of burials with stone bracelets in this wide geographical area is related to post-depositional problems or a lack of research and publication within this chronology. In France and Belgium, there are several cases of burials from the Villeneuve-Germain/Blicquy Neolithic culture which prove that stone bracelets' burial associations are more widespread (Fromont, 2013, p. 257).

- (2) The bracelets were worn long enough to show use-wear traces on their surfaces. Studies have allowed the identification of the traces of wear in the internal face of bracelets (Martínez-Sevilla, 2018, p. 239, 2019; Ifantidis, 2019). The raw material hardness and the time of use determine the typology of the traces, these range from a bright patina over the abrasion marks left from production to their complete removal by polish. Contact with the acidic body fluids present on the skin generates these lustres and polished surfaces over a long period of time (Vanhaeren, d'Errico, Van Niekerk, Henshilwood, & Erasmus, 2013). Notably, a significant number of bracelets do not show use-wear traces, and they could be interpreted as briefly used, infrequently used or, maybe, they were not used at any point.
- (3) The internal diameter of bracelets could be related to their use. The different dimensions can be related to a certain position on the body or even with age and gender. The study of hand and elbow sizes in current populations, including adults and children of both sexes, indicated their possible use above the elbow by all population groups (Martínez-Sevilla, 2018, p. 238). In our dataset, all the bracelets with an internal diameter bigger than 40 mm could be used as a bracelet. The small artifacts (<40 mm) could be interpreted as ring pendants or maybe also very fine club heads since the crown is too wide for finger rings, some could also have been decorative clothes fasteners. In any case, these ornaments were prestigious objects to wear, hang, show, or exchange.

A shared practice in all regions is the repair and re-use of stone bracelets. Recording re-fitting bracelet fragments within assemblages, or their alteration into pendants and/or beads is common. These practices are the reflection of the personal or social value of these ornaments in this broad geographical area. The heavy polish use-wear in the internal face of the bracelets and the repair and re-use could be interpreted as indications of authentic heirlooms (Lillios, 1999) and probably that they had a high individual and social value.

5 Conclusion

This overview from areas around the Mediterranean Sea, including the analysis of 701 stone ring-shaped objects from 275 archaeological sites, that we have presented gives a comprehensive picture of their use by the Neolithic communities of different geographical zones. These adornments were mainly used as bracelets and their use and movement show variances in the social and economic organization of the first farming communities.

The documentation of stone bracelets in a wide range of Neolithic contexts, such as settlements, burials, or ritualized contexts, allows us to interpret them as part of the social lifecycle of Neolithic groups and part of their social identity. The radiocarbon dates, in secure stratigraphic contexts, and the initial material culture related with this type of adornment spans a period from the 10th–6th millennia BC. There is a gradual chronological spread from east to west through time and an association of stone bracelets with

the first Neolithic populations in different Mediterranean areas. Even with this clear chronological graduation, there are some areas with an absence of stone bracelets in the earliest Neolithic sites, as is the case in Greece and the south of Italy. Maybe in these zones shell bracelets were more representative of the earliest moments of the Neolithic spread. Thus, even considering these gaps in the stone bracelets' distribution, this suggests a continuity of tradition for several thousand years and across thousands of kilometers.

While the bracelets had a particular development in each studied area, with a specific typology, raw materials, and colors, they shared many common characteristics. Most stone rings were used as bracelets, given their internal diameter, and they had a long biography, reflecting the personal or social value of these ornaments in this broad geographical area.

Stone bracelets should be considered as a complex archaeological trans-cultural manifestation related to the spreading of the Neolithic lifestyle across the Mediterranean Sea and in many parts of the European continent.

Acknowledgments: We would like to thank Prof. Chris Scarre from Durham University for his support during the conception of this work and the anonymous reviewers for their insightful comments.

Author contributions: All authors have accepted responsibility for the entire content of this manuscript and approved its submission. FMS designed the research; FMS, EB, RM, FI, and CL performed the research. FMS prepared the manuscript with contributions from all co-authors. All the authors were involved in reviewing the manuscript.

Conflict of interest: Authors state no conflict of interest.

Data availability statement: The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

References

- Alarashi, H. (2016). Butterfly beads in the neolithic Near East: Evolution, technology and socio-cultural implications. *Cambridge Archaeological Journal*, 26(3), 493–512. doi: 10.1017/S0959774316000342.
- Al Nahar, M. (2014). Ain Ghazal and Wadi Shueib: Neolithic personal ornaments. In O. Bar-Yosef, B. Finlayson, & C. Makarewicz (Eds.), *Settlement, survey, and stone: Essays on near Eastern prehistory in honor of Gary Rollefson* (pp. 243–256). Berlin: Ex Oriente.
- Angeli, L. (in press). Sergnano (CR): Un atelier di lavorazione della pietra levigata. In *Preistoria e Protostoria in Lombardia e Canton Ticino*, Studi di Preistoria e Protostoria. Firenze: Istituto Italiano di Preistoria e Protostoria.
- Astruc, L., Vargiolu, R., Ben Tkaya, M., Balkan-Atli, N., Özbas Aran, M., & Zahouani, H. (2011). Multi-scale tribological analysis of the technique of manufacture of an obsidian bracelet from Aşıklı Höyük (Aceramic Neolithic, Central Anatolia). *Journal of Archaeological Science*, 38(12), 3415–3424. doi: 10.1016/j.jas.2011.07.028.
- Ay-Efe, D. (2001). The small finds. In T. Efe (Ed.), *The salvage excavations at Orman Fidanlığı a Chalcolithic site in Inland Northwestern Anatolia* (pp. 127–158). Istanbul: TASK Vakfı Yayınları.
- Baysal, E., Baysal, A., Türkcan, A. U., & Nazaroff, A. (2015). Early specialized production? A Chalcolithic stone bracelet workshop at Kanlıtaş, Turkey. *Oxford Journal of Archaeology*, 34(3), 235–257. doi: 10.1111/ojoa.12057.
- Bourdieu, J. (1977). *Outline of a theory of practice*. Cambridge: Cambridge University Press.
- Carrasco Rus, J., & Martínez-Sevilla, F. (2014). Las cronologías absolutas del Neolítico Antiguo en el sur de la península ibérica: Nuevas dataciones. *Archivo de Prehistoria Levantina*, XXX, 57–80.
- Carrasco Rus, J., Morgado, A., & Martínez-Sevilla, F. (2016). Implantación y desarrollo de los grupos neolíticos del sur de la Península Ibérica. Reflexiones sobre algunos modelos interpretativos desde los inicios del siglo XXI. In *Del Neolítico a l'Edat del Bronce en el Mediterrani occidental. Estudis en homenatge a Bernart Martí Oliver* (pp. 159–180). Valencia: Treballs Varios SIP 117.
- Chondrogianni-Metoki, A. (2009). *Non-domestic use of space in the Neolithic settlements: The example of Toumba Kremastis Koiladas*. (Unpublished PhD thesis. [In Greek]). Thessaloniki: Aristotle University of Thessaloniki.
- Çilingiroğlu, Ç. (2005). The concept of “Neolithic package”: Considering its meaning and applicability. *Documenta Praehistorica*, 32, 1–13.

- Courtin, J. (2000). *Les premiers paysans du Midi, Histoire de la France Préhistorique de 6000 à 4500 ans*. Paris: La Maison des Roches.
- Courtin, J., & Gutherz, X. (1976). Les bracelets de pierre du Néolithique méridional. *Bulletin de la Société Préhistorique Française*, 73(1), 352–369. doi: 10.3406/bspf.1976.8398.
- Dikaïos, P. (1953). *Khirokitia final report on the excavation of a Neolithic settlement in Cyprus on behalf of the Department of Antiquities 1936–1946*. London: Oxford University Press.
- Erdoğu, B. (2013). Uğurlu: A Neolithic settlement on the Aegean island of Gökçeada. In M. Özdoğan, N. Başgelen, & P. Kuniholm (Eds.), *The Neolithic in Turkey new excavations and new research: Northwestern Turkey and Istanbul* (pp. 1–33). Istanbul: Arkeoloji ve Sanat Yayınları.
- Erdoğu, B., & Çevik, Ö. (2020). A comparative study of the sixth millennium B.C. marble bracelets from Ulucak and Uğurlu. *Anatolia Antiqua*, XXVII, 29–32.
- Erim-Özdoğan, A. (2011). Çayönü. In M. Özdoğan, N. Başgelen, & P. Kuniholm (Eds.), *The Neolithic in Turkey new excavations and new research: The Tigris basin* (pp. 185–269). Istanbul: Arkeoloji ve Sanat Yayınları.
- Evans, J. D. (1964). Excavations in the Neolithic settlement of Knossos, 1957–1960: Part I. *Annual of the British School at Athens*, 59, 134–240. doi: 10.1017/S0068245400006109.
- Faudino, V., & Tiberio, D. (2011). La catena operativa di produzione degli anelloni in pietra verde. In F. Marzatico, R. Gebhard, & P. Gleirscher (Eds.), *Le grandi vie delle civiltà. Relazioni e scambi fra Mediterraneo e il centro Europa dalla preistoria alla romanità* (p. 423). Trento: Museo Castello del Buonconsiglio.
- French, D. (2010). *Canhasan I: The small finds*. London: British Institute at Ankara.
- Fromont, N. (2013). *Anneaux et cultures du néolithique ancien: Production, circulation et utilisation entre massifs ardennais et armoricain* (BAR International Series 2499). Oxford: BAR.
- Garfinkel, Y., & Dag, D. (2008). *Neolithic ashkelon, qedem 47*. Jerusalem: The Hebrew University of Jerusalem.
- Gavilán Ceballos, B., & Rafael Penco, J. J. (1999). Análisis de la industria ornamental de la Cueva de los Murciélagos de Zuheros (Córdoba). In *II Congreso del Neolítico a la Península Ibérica, Universitat de València* (pp. 157–162). Valencia: SAGVNTVM PLAV EXTRA 2.
- Gebel, H. G. K., & Bienert, H.-D. (1997). Ba'ja hidden in the Petra Mountains, preliminary report on the 1997 excavations. In H. G. K. Gebel & G. O. Rollefson (Eds.), *The prehistory of Jordan, perspectives from 1997* (pp. 221–262). Berlin: Ex Oriente.
- Grammenos, D. V., & Kotsos, S. (2002). *Salvage excavations at the Neolithic settlement of Stavroupoli, Thessaloniki*. Thessaloniki: Archaeological Institute of Northern Greece. [In Greek]
- Gubenko, N., Barzilai, O., & Hamoudi, K. (2009). Rabud: A pre-pottery Neolithic B site South of Hebron. *Journal of the Israel Prehistoric Society*, 39, 63–80.
- Harrison, R. J., & Orozco Köhler, T. (2001). Beyond characterisation: Polished stone exchange in the Western Mediterranean 5500–2000 BC. *Oxford Journal of Archaeology*, 20(2), 107–127. doi: 10.1111/1468-0092.00126.
- Horejs, B., Milić, B., Ostmann, F., Thanheiser, U., Weninger, B., & Galik, A. (2015). The Aegean in the early 7th millennium BC: Maritime networks and colonization. *Journal of World Prehistory*, 28(4), 289–330. doi: 10.1007/s10963-015-9090-8.
- Ifantidis, F., & Nikolaidou, M. (Eds.). (2011). *Spondylus in prehistory: New data and approaches* (BAR International Series 2216). Oxford: BAR.
- Ifantidis, F., & Papageorgiou, P. (2011). Sur un anneau néolithique en marbre fragmenté (Dispilio, Grèce). In F. Wateau (Ed.), *Profils d'objets: Approches d'anthropologues et d'archéologues* (pp. 33–43). Paris: De Boccard.
- Ifantidis, F. (2019). *Practices of personal adornment in Neolithic Greece*. Oxford: Archaeopress. [In Greek]
- Karul, N., & Avci, M. (2013). Aktopraklık. In M. Özdoğan, N. Başgelen, & P. Kuniholm (Eds.), *The Neolithic in Turkey new excavations and new research: Northwestern Turkey and Istanbul* (pp. 45–68). Istanbul: Arkeoloji ve Sanat Yayınları.
- Karul, N. (2017). *Aktopraklık*. Istanbul: Ege Yayınları.
- Kodaş, E. (2019). Un nouveau site du néolithique précéramique dans la vallée du Haut Tigre: Résultats Préliminaires de Boncuklu Tarla. *Neo-Lithics*, 2019, 3–15.
- Kodaş, E., & Erdoğan, N. (2018). Boncuklu Tarla 2017 Yılı Kazıları. *Kazı Sonuçları Toplantısı*, 40(1), 693–710.
- Kodaş, E., Genç, B., Labedan-Kodaş, C., İpek, B., & Erdoğan, N. (2019). Boncuklu Tarla Çanak-Çömleksiz Neolitik Dönem'e Tarihlenen Bir Grup Figürlü Kemik Plak. *Artuklu İnsan ve Toplum Bilim Dergisi*, 4(1), 1–6.
- Kozłowski, S. K., & Aurenche, O. (2005). *Territories, boundaries and cultures in the Neolithic near East* (BAR International Series 1362). Oxford: BAR.
- Kyparissi-Apostolika, A. (2001). *The prehistoric jewels of Thessaly*. Athens: Ministry of Culture. [In Greek]
- Lillios, K. T. (1999). Objects of memory: The ethnography and archaeology of heirlooms. *Journal of Archaeological Method and Theory*, 6(3), 235–262. doi: 10.1023/A:1021999319447.
- Maniatis, Y., Papadopoulos, S., Dotsika, E., Kavoussanaki, D., Tzavidopoulos, E., & Tzavidopoulos, I. (2009). Provenance investigation of Neolithic marble vases from Limenaria, Thassos: Imported marble to Thassos? In Y. Maniatis (Ed.), *ASMOSIA VII, Proceedings of the 7th International Conference of the Association for the Study of Marble and Other Stones in Antiquity* (pp. 439–449). Athènes: Ecole française d'Athènes.
- Maréchal, C. (1985). Les bracelets néolithiques en pierre de Cafer Höyük (Turquie). *Cahiers de l'Euphrate*, 4, 109–115.
- Martínez Sánchez, C. (1994). Nueva datación de C-14 para el Neolítico de Murcia: Los Abrigos del Pozo (Calasparra). *Trabajos de Prehistoria*, 52, 157–161.

- Martínez-Sevilla, F. (2010). Un taller neolítico de brazaletes de piedra en la cueva de los Mármoles (Priego de Córdoba). *Antiquitas*, 22, 35–55.
- Martínez-Sevilla, F. (2018). *Brazaletes de piedra neolíticos en la península ibérica (VI-V milenio a. C.): Tecnología, funcionalidad y circulación* (BAR International Series 2913). Oxford: BAR.
- Martínez-Sevilla, F. (2019). Assessing the cultural and social value of Neolithic stone bracelets in the Iberian Peninsula. *Journal of Anthropological Archaeology*, 55, 101080. doi: 10.1016/j.jaa.2019.101080.
- Martínez-Sevilla, F., Carrasco Rus, J., Lozano Rodríguez, J. A., Jiménez Cobos, F., & Gutiérrez Rodríguez, M. (2018). Un sitio de extracción de mármol para hacer brazaletes: La cantera neolítica de Cortijo Cevico (Ventorros de San José-Loja, Granada). *Trabajos de Prehistoria*, 75(2), 344–360. doi: 10.3989/tp.2018.12220.
- Martínez-Sevilla, F., & Salmerón Juan, J. (2014). La artesanía de los brazaletes líticos de la Cueva-Sima de la Serreta (Cieza, Murcia): Tecnología, útiles y funcionalidad del sitio. *Zephyrus*, LXXIV, 65–87. doi: 10.14201/zephyrus2014746587.
- Martín-Socas, D., Camalich Massieu, M. D., Caro Herrero, J. L., & Rodríguez-Santos, F. J. (2018). The beginning of the Neolithic in Andalusia. *Quaternary International*, 470, 451–471. doi: 10.1016/j.quaint.2017.06.057.
- Mellaart, J. (1970). *Excavations at Hacilar*. Edinburgh: Edinburgh University Press.
- Micheli, R. (2012a). Personal ornaments, Neolithic groups and social identities: Some insights into Northern Italy. *Documenta Praehistorica*, XXXIX, 227–255. doi: 10.4312/dp.39.16.
- Micheli, R. (2012b). Raw materials, personal ornaments and Neolithic groups: Some observations on stone bracelets of the Early Neolithic of northern Italy. In M. Borrell, F. Borrell, J. Bosch, & M. Molist (Eds.), *Networks in the Neolithic. Raw materials, products and ideas circulation in the Western Mediterranean basin (VII-III a.C.)*. *Proceedings of the international conference (Gavà and Bellaterra, 2–4 February 2011)* (pp. 241–248). Rubricatum. Revista del Museu de Gavà, 5.
- Micheli, R. (2014). Stone bracelets/l bracciali in pietra. In P. Visentini & E. Produg (Eds.), *Adriatico senza confini. Via di comunicazione e crocevia di popoli nel 6000 a.C.* (pp. 198–199). Udine: Civici Musei/Museo Friulano di Storia Naturale.
- Micheli, R. (2018). Gli ornamenti personali. In G. Steffè & N. Degasperì (Eds.), *Il villaggio neolitico di Lugo di Romagna – Fornace Gattelli. Strutture, Ambiente, Culture, Origines* (pp. 557–576). Firenze: Istituto Italiano di Preistoria e Protostoria.
- Miller, J. (2009). Things as persons: Body ornaments and alterity among the Mamaindê (Nambikwara). In F. Santos-Granero (Ed.), *The occult life of things: Native amazonian theories of materiality and personhood* (pp. 60–80). Tucson: University of Arizona Press.
- Miller, M. A. (1997). *Jewels of shell and stone, clay and bone: The production, function and distribution of Aegean stone age ornaments*. (Unpublished PhD thesis). Boston: Boston University.
- Newell, R. R., Kielman, D., Constandse-Westermann, T., van Gijn, A., & van der Sanden, W. A. B. (1990). *An inquiry into the ethnic resolution of mesolithic Regional groups: The study of their decorative ornaments in time and space*. Leiden: E. J. Brill.
- Noain Maura, M. J. (1996). El adorno personal del Neolítico peninsular. Sus contenidos simbólicos y económicos. In M. Molist & J. Bosch (Eds.), *I Congrés del Neolític a la Península Ibérica. Formació e implantació de les comunitats agrícoles*. (Gavà-Bellaterra 1995). *Rubricatum*, 1(1), 270–278.
- Orozco-Köhler, T. (2016). Los brazaletes de esquisto: Un elemento de la identidad cardial. In *Del Neolític a l'Edat del Bronze en el Mediterrani occidental. Estudis en homenatge a Bernart Martí Oliver* (TV SIP 119, pp. 141–146). Valencia: Diputació de Valencia.
- Özbaşaran, M., & Duru, G. (2011). Akarçay Tepe. In M. Özdoğan, N. Başgelen, & P. Kuniholm (Eds.), *The Neolithic in Turkey new excavations and new research: The Euphrates basin* (pp. 165–202). Istanbul: Arkeoloji ve Sanat Yayınları.
- Özdoğan, A. (1994). *Çayönü yerleşmesinin çanak çömleksiz Neolitikteki yeri*. (PhD thesis). Istanbul: Istanbul University.
- Öztan, A. (2012). Köşk Höyük. In M. Özdoğan, N. Başgelen, & P. Kuniholm (Eds.), *The Neolithic in Turkey new excavations and new research: Central Turkey* (pp. 31–70). Istanbul: Arkeoloji ve Sanat Yayınları.
- Pailler, Y. (2007). *Des dernières industries à trapèzes à l'affirmation du Néolithique en Bretagne occidentale (5500–3500 av. J.-C.)* (BAR International Series 1648). Oxford: BAR.
- Palaiologou, M. (2007). Promachon-Topolnica. Items of adornment and marble vessels: A preliminary approach. *The Archaeological Work in Macedonia and Thrace*, 21, 347–354. [In Greek]
- Pascual Benito, J. L. L. (1998). *Utillaje óseo, adornos e ídolos neolíticos valencianos* (Serie de Trabajos Varios del SIP. 95). Valencia: Diputación Provincial de Valencia.
- Pessina, A., & D'Amico, C. (1999). L'industria in pietra levigata del sito neolitico di Sammardenchia (Pozzuolo del Friuli, Udine): Aspetti archeologici e petroarcheometrici. In A. Ferrari & A. Pessina (Eds.), *Sammardenchia – C'è eis. Contributi per la conoscenza di una comunità del primo* (pp. 23–78). Udine: Museo Friulano di Storia Naturale.
- Pessina, A. (1998). Aspetti culturali e problematiche del primo Neolitico dell'Italia settentrionale. In A. Pessina & G. Muscio (Eds.), *Settemila anni fa... il primo pane. Ambiente e culture delle società neolitiche* (pp. 95–105). Udine: Museo Friulano di Storia Naturale.
- Pétrequin, P., Cassen, S., Errera, M., Pailler, Y., Prodéo, F., Pétrequin, A.-M., & Sheridan, A. (2019). Disc-rings of Alpine rock in western Europe. Typology, chronology, distribution and social significance. In R. Gleser & D. Hofmann (Eds.), *Contacts, boundaries & innovation: Exploring developed Neolithic societies in Central Europe and beyond* (pp. 305–334). Leiden: Sidestone Press.
- Pétrequin, P., Pétrequin, A.-M., Errera, M., & Prodéo, F. (2012). Prospections alpines et sources de matières premières. Historique et résultats. In P. Pétrequin, S. Cassen, M. Errera, L. Klassen, A. Sheridan, & A.-M. Pétrequin (Eds.), *Jade*.

- Grandes haches alpines du Néolithique européen. Ve et IVe millénaires av. J.-C.* (Les Cahiers de la Maison des sciences de l'Homme Ledoux, 17, Dynamiques territoriales, 6, Vol. I, pp. 46–183). Besançon: Presses Universitaires de Franche-Comté and Centre de Recherche archéologique de la Vallée de l'Ain.
- Pétrequin, P., Pétrequin, A.-M., Pailler, Y., Buthod-Ruffier, D., Cassen, S., Eibl, F., Errera, M. & Prodeo, F. (2017). Les anneaux-disques réguliers à section triangulaire en jade ou en serpentinite. In P. Pétrequin, E. Gauthier, A.-M. Pétrequin (Eds.), *Jade. Objets signes et interprétations sociales des jades alpins dans l'Europe néolithique*. (Les Cahiers de la MSHE Ledoux 17, Série Dynamiques Territoriales 10, Vol. 3, pp. 611–638). Besançon: Presses Universitaires de Franche-Comté and Centre de Recherche archéologique de la Vallée de l'Ain.
- Ribero, M. (2017). Anelloni litici italiani: Aggiornamenti e nuove proposte interpretative a quaranta anni dalle prime ricerche. *Rivista di Scienze Preistoriche*, LXVII, 111–144. doi: 10.32097/1004.
- Rigaud, S., d'Errico, F., & Vanhaeren, M. (2015). Ornaments reveal resistance of North European cultures to the spread of farming. *PLoS One*, 10(4), e0121166. doi: 10.1371/journal.pone.0121166.
- Roach-Higgins, M. E., & Eicher, J. B. (1992). Dress and identity. *Clothing and Textiles Research Journal*, 10(1), 1–8.
- Rubio De Miguel, I. (1993). La función social del adorno personal en el Neolítico de la Península Ibérica. *Cuadernos de Prehistoria de la Universidad Autónoma de Madrid*, 20, 27–58.
- Schoop, U.-D. (2005). Early chalcolithic in North-Central anatolia: The evidence from Boğazköy-Büyükkaya. *TÜBA-AR*, 8, 15–37.
- Seeger, A. (1975). The meaning of body ornaments: A Suyá example. *Ethnology*, 14(3), 211–224. doi: 10.2307/3773253.
- Seeher, J. (1987). Antalya yakınlarında Karain Mağarasındaki Kalkolitik Çağ buluntuları. V. *Araştırma Sonuçları Toplantısı*, 5(2), 221–238.
- Shorthouse, D. P. (2010). SimpleMappr, an online tool to produce publication-quality point maps. [Retrieved from <https://www.simplemappr.net>. Accessed October 19, 2020].
- Starck, J. (1988). Comparative analysis of stone-ring artefacts from Baga and Basta. In A. Garrard & H. Gebel (Eds.), *The Prehistory of Jordan, the State of Research in 1986*, (BAR International Series 396:1, pp. 137–174). Oxford: BAR.
- Starnini, E., Biagi, P., & Mazzucco, N. (2018). The beginning of the Neolithic in the Po Plain (northern Italy): Problems and perspectives. *Quaternary International*, 470, 301–317. doi: 10.1016/j.quaint.2017.05.059.
- Starnini, E., D'Amico, C., Biagi, P., Ghedini, M., & Pitti, G. (2004). Strumenti in pietra levigata dalla Lombardia orientale: Aspetti archeometrici e culturali. *Bullettino di Paleontologia Italiana*, 95(n.s. XIII), 21–82.
- Tanda, G. (1977). Gli anelloni litici italiani. *Preistoria Alpina*, 13, 111–155.
- Teruel Berbel, M. S. (1986). Objetos de adorno en el Neolítico de Andalucía Oriental: Síntesis tipológica. *Cuaderno de prehistoria de la Universidad de Granada*, 11, 9–26.
- Traversone, B. (1996). Gli oggetti ornamentali. In *Le vie della pietra verde. L'industria litica levigata nella preistoria dell'Italia settentrionale* (pp. 197–207). Torino: Omega edizioni.
- Turner, T. (1995). Social body and embodied subject: Bodiliness, subjectivity, and sociality among the Kayapo. *Cultural Anthropology*, 10(2), 143–170. doi: 10.1525/can.1995.10.2.02a00010.
- Ünlüsoy, S. (2002). Neolithische und Chalkolithische Steinarmringe: Untersuchungen zur Chronologie und Verbreitung von Steinarmringen im Nahen Osten und in der Ägäis. In R. Aslan, S. Blum, G. Kastl, F. Schweizer, & D. Thumm (Eds.), *Mauerschau: Festschrift für Manfred Korfmann Band 2* (pp. 543–565). Remshalden-Grunbach: Verlag Bernard Albert Greiner.
- Valdiosera, C., Günther, T., Vera-Rodríguez, J. C., Ureña, I., Iriarte, E., Rodríguez-Varela, R., ... Jakobsson, M. (2018). Four millennia of Iberian biomolecular prehistory illustrate the impact of prehistoric migrations at the far end of Eurasia. *Proceedings of the National Academy of Sciences of the United States of America*, 115(13), 3428–3433. doi: 10.1073/pnas.1717762115.
- Vanhaeren, M., d'Errico, F., Van Niekerk, K. L., Henshilwood, C. S., & Erasmus, R. M. (2013). Thinking strings: Additional evidence for personal ornament use in the middle stone age at Blombos Cave, South Africa. *Journal of Human Evolution*, 64(6), 500–517. doi: 10.1016/j.jhevol.2013.02.001.
- Vardi, J., Yegorov, D., & Khalaily, H. (2020). Daily life at the final pre-pottery Neolithic B megasite of Motza (Judean Hills) based on the material culture. In H. Khalaily, A. Re'em, J. Vardi, & I. Milevski (Eds.), *The mega project at Motza (Moza): The neolithic and later occupations up to the twentieth century new studies in the archaeology of Jerusalem and its region* (pp. 101–130). Jerusalem: Israel Antiquities Authority.
- Vasić, M. (2020). *Personal adornment in the neolithic middle east: A case study of Çatalhöyük*. Berlin: Ex oriente.
- Wright, K., & Garrard, A. (2003). Social identities and the expansion of stone bead-making in Neolithic Western Asia: New evidence from Jordan. *Antiquity*, 77(296), 267–284. doi: 10.1017/S0003598X00092267.
- Wright, K. I., Critchley, P., Garrard, A., Baird, D., Bains, R., & Groom, S. (2008). Stone bead technologies and early craft specialization: Insights from two Neolithic sites in eastern Jordan. *Levant*, 40(2), 131–165. doi: 10.1179/175638008X348016.
- Ziota, C. (2011). The Neolithic settlement “Kleitos 1” and the latest data for prehistoric research. *The Archaeological Work in Upper Macedonia*, 1, 211–230. [In Greek]