

The Sexual Attribution of the La Quina 5 Neandertal

La diagnose sexuelle du Néandertalien La Quina 5

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Abstract Morphological and paleobiological assessments of the Neandertals are improved by appropriate sexual attributions of fossil remains. The La Quina 5 partial Neandertal skeleton has usually been considered as female, despite the absence of its pelvis and recognition of its large and robust facial skeleton. Its sexual affinities were therefore reassessed relative to pelvically sexed and unsexable Neandertal remains, using its neurocranial, facial, and appendicular dimensions. Its endocranial capacity and parietal thickness, although small, appear undiagnostic with regard to sex. Its radial length, femoral diaphyseal size, mandibular corpus dimensions, and supraorbital torus thickness are intermediate between those of males and females. Its mandible length and mastoid process projection and its humeral length, articular size, and diaphyseal hypertrophy align it with male Neandertals. On the basis of these comparisons, La Quina 5 appears to be either male or indeterminate with regard to its sex, the latter conclusion being the more cautious one. It is unlikely to have been a female.

Keywords Sexual dimorphism · Late Pleistocene · Cranium · Mandible · Humerus · Radius

Résumé Les évaluations morphologiques et paléobiologiques des Néandertaliens sont améliorées par des indications sexuelles fiables pour les restes fossiles. Le squelette partiel du Néandertalien de La Quina, La Quina 5, a le plus souvent été considéré comme femelle, malgré l'absence du coxal et les remarques de Martin, Hrdlička et Smith sur la robustesse et la grandeur de son squelette facial. Étant donné l'importance des identifications sexuelles pour certaines analyses paléoanthropologiques, la diagnose sexuelle de La Quina 5 a été reprise, par comparaison avec des Néandertaliens avec ou sans indications sexuelles coxales. Ses dimensions neurocrâniennes, faciales et des os des membres ont été utili-

sées. Sa capacité crânienne est petite mais pas diagnostique pour le sexe, puisqu'il y a des Néandertaliens mâle (Feldhofer 1) et femelle (Tabun 1) avec des crânes aussi petits. Son épaisseur pariétale, avec celle de Tabun 1, est exceptionnellement petite par rapport aux autres Néandertaliens. La longueur du radius, la grandeur de la diaphyse fémorale et l'épaisseur du torus supraorbitaire se placent entre les mâles et femelles néandertaliens. En revanche, la longueur de la mandibule, la projection du processus mastoïde et les dimensions de l'humérus (longueur, hypertrophie diaphysaire et largeur articulaire) le rangent parmi les Néandertaliens mâles. À la suite de ces comparaisons, La Quina 5 doit être considéré comme mâle ou de sexe inconnu, la seconde interprétation étant la plus prudente. Il est difficile de le considérer comme femelle.

Mots clés Dimorphisme sexuel · Pléistocène supérieur · Cranium · Mandibule · Humérus · Radius

Introduction

The assessment of a number of aspects of Neandertal morphology and especially paleobiology is enhanced by the appropriate determination of the sexes of the fossil specimens in question. For most isolated skeletal elements (except ossa coxarum) this is a difficult task, and their sexes are usually considered to be unknowable (the exceptions being ones preserving adequate nDNA [e.g., 1]). For associated partial skeletons, however, sexual diagnoses are often provided, preferably based on sexually diagnostic portions of the pelvis. However, for a number of the known Neandertal partial skeletons, diagnostic pelvic remains have not been preserved, and sexual assessments have been based on combinations of morphology and (especially) size. The use of morphological attributes begs the question of Neandertal discrete trait dimorphism, and given their general hypertrophy relative to recent humans, has often led to a surfeit of males [2]. Body size dimorphism, however,

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appears to have been close to that of recent humans (or at least statistically indistinguishable from recent human sexual dimorphism [3]); it should therefore be possible to employ it to assign probable sexes to a number of Neandertals, at least for those specimens falling at the upper and lower extents of Neandertal size variation. For specimens of more intermediate dimensions, such size assessments become tenuous.

One of the Neandertal fossil partial skeletons that has figured in these considerations is La Quina 5, excavated in the Middle Paleolithic Level 3 of the Station Amont de La Quina (Charente, France) in 1911 [4]. In his monograph on La Quina 5, Martin [5, p 239] considered it to be female based on the thinness of the neurocranial vault, the small brain size, and the gracility of the vertebral neural arches (now lost), the left humerus and the femora. Yet, he noted the hypertrophy of the mandible and muscular insertions, which made it appear less female. Subsequently, Keith [6] and Vallois [7] accepted it as female. Hrdlička [8, p 286] preferred a female diagnosis, although he noted that the supraorbital torus, the zygomatic bones and especially the mandible and teeth “are much more masculine than feminine.” Most subsequent authors have either considered it as female [e.g., 9–13] or probably female [e.g., 3,14–16]. However, Howell [17] listed it as male, and Smith [18] considered La Quina 5 to be male or intermediate between the sexes based on the supraorbital region, mastoid processes and nuchal plane. Recently, Verna [19] concluded that its sex is unknowable, given the absence of pelvic remains and the unknown sexual variability in other aspects of the skeleton for the population from which La Quina 5 derived.

With these varied conclusions, and the limitations of using size alone to ascribe sex [3,19], the skull and postcranial dimensions of La Quina 5 are reassessed with respect to a sexual attribution. The comparative Neandertal sample has increased since the last systematic assessments [3,18], and it is possible to combine cephalic, upper limb and lower limb measures.

Materials and Methods

The comparisons include data from La Quina 5 and other marine isotope stage (MIS) 5 to 3 western Eurasian Neandertals (not including the MIS 6/5 Krapina sample). The comparative specimens are divided in pelvically sexable males and females, plus ones without diagnostic pelvic remains. Sex assessment is based principally on the shape of the greater sciatic notch, given its apparent conformation to recent human patterns of sexual dimorphism through the genus *Homo* [e.g., 20–22] and contrasts in pubic dimensions between Neandertals and recent humans [23–25]. The shape of the greater sciatic notch (GSN) was assessed visually, following Walker [26] and Brůžek [27], given frequent damage

to the region of the posterior inferior iliac spine; in none of the cases of assigned sex was the sexual affinity of the GSN ambiguous. The one exception to using the GSN was Shanidar 3, whose sex assessment is based on the form of the ischiopubic ramus [24]. It is fully recognized that the attribution of sex to these skeletal remains has its limitations, but these assessments provide a minimal framework for reconsidering the sex of La Quina 5.

The “males” include Amud 1 (e, p, mp, t, ml, mc, ha, fd), La Chapelle-aux-Saints 1 (e, p, mp, t, hl, ha, rl, hd, fd), Feldhofer 1 (e, p, t, hl, ha, rl, fd), La Ferrassie 1 (e, p, mp, t, ml, mc, hl, ha, rl, hd, fd), Kebara 2 (ml, mc, hl, ha, rl, hd), Regourdou 1 (ml, mc, hl, ha, rl, hd), and Shanidar 1 (e, p, mp, t, ml, mc, ha), 3 (hl, ha, hd) and 4 (p, t, hl, ha, rl, hd, fd) [27–31]. The “females” include La Ferrassie 2 (mp, hl, ha, rl, hd, fd), Palomas 96 (t, hl, hd, fd) and Tabun 1 (e, p, mp, t, ml, mc, hl, ha, rl, hd, fd) [23,32,33] [For each specimen, the measurements provided are indicated parenthetically as: e: endocranial capacity; p: parietal thickness; mp: mastoid projection; t: supraorbital torus thickness; ml: mandible length; mc: mandible corpus size; hl: humerus length; rl: radius length; ha: humerus distal articular breadth; hd: humeral diaphysis; fd: femoral diaphysis]. The unsexed specimens include Arcy-Hyène 9 (mc), Banyoles 1 (ml, mc), Fond-de-Forêt 1 (fd), Forbes’ Quarry 1 (e, p, mp, t), Gánovce 1 (e), Gegant 1 (mc), Guattari 1 (e, p), Guattari 2 (mc), Guattari 3 (ml, mc), Kůlna 1 (p), Lezetxiki 1 (hl, ha, hd), Monsempron 5 (p), Le Moustier 1 (e), La Naulette 1 (mc), Palomas 1, 6, 23 and 59 (mc), Palomas 52 (fd), Palomas 56 (p), Palomas 92 (hl, ha, hd, fd), La Quina 9 (ml, mc), La Quina 13, 25 and 37 (p), La Quina 10 and 27 (mp), La Quina 38 (fd), Rocher-de-Villeneuve 1 (fd), Saint-Césaire 1 (t, ml, mc, ha, rl, fd), Šal’a 1 (t), Spy 1 (e, p, mp, t, ml, mc, ha, hd), Spy 2 (e, p, mp, t, ha, hd, fd), Shanidar 2 (p, mp, mc), Shanidar 5 (e, p, mp, t, rl, fd), Shanidar 6 (hl, ha, rl, hd, fd), Saccopastore 1 (e), Subalyuk 1 (mc), Tabun 3 (fd), Vindija 202, 260–262 and 264 (t), Vindija 204 and 293 (p), Vindija 206, 231 and 250 (mc), Vindija 226 (ml, mc), and Zafarraya 2 (ml, mc).

The La Quina 5 data derive from personal measurement of the original specimen in the Musée de l’Homme and the Musée d’archéologie nationale, supplemented with observations from Martin [5]. The comparative data derive from personal assessment of the original remains, plus published measurements from original descriptions and, in a few cases, from high quality resin casts.

For each dimension, the La Quina 5 value is plotted against the “male,” “female” and unsexed ones. The measures are ones that have either been employed in previous assessments of the La Quina 5 sex or ones that provide an indication of overall neurocranial, facial and appendicular size and/or hypertrophy. Given the fragmentary nature of the La Quina 5 postcrania, for which only two humeri, a

forearm and two femora survive, the postcranial dimensions are limited to brachial and antebrachial lengths, humeral diaphyseal and distal epiphyseal dimensions, and femoral diaphyseal size. Given the marked asymmetry of the humeral diaphyses (but not their epiphyses) [5,34], data from the larger (dominant arm) right humerus are employed. They are combined with data from the largely complete left ulna and radius (Fig. 1)¹.

The comparisons thus include endocranial capacity, parietal thickness, lateral supraorbital torus thickness, a measure of mandible length (mid-condyle to C₁/P₃ buccal alveolus, given the absence of the La Quina 5 symphysis), lateral mandibular corpus size, humeral and radial lengths, humeral distal articular breadth, and humeral and femoral diaphyseal size. The torus thickness follows Smith and Ranyard [35]. The mandibular corporeal and appendicular diaphyseal comparisons employ the polar moment of area, because it quantifies both the overall size of a beam structure and its general resistance to loads; the diaphyseal ones were computed using SLCOMM [36] and the mandibular ones from the mental foramen height and breadth using ellipse formulae [37]. The quantitative assessments are principally visual, given the limited sample sizes for Neandertals and especially for pelvically sexed ones. As noted by Verna [19], these comparisons to assess the sex of La Quina 5 may be an exercise in futility, but they should nonetheless be sufficient to indicate whether the remains appear distinctly female, distinctly male, intermediate or a mosaic of male and female aspects.

Results

Cranial Aspects

As noted by Henri-Martin, the La Quina 5 neurocranium provides a low endocranial volume (ECV) for a Neandertal. He estimated its ECV at $\approx 1,350$ cc based on water displacement of a reconstructed endocranial cast [5, p 212], and Verna [19, p 120] found a range of values from ≈ 1280 to ≈ 1580 cc based on different formulae and external neurocranial measurements, with most values falling between ≈ 1350 and ≈ 1450 ; the original direct measure is employed here,

¹ Subsequent to the 1923 monograph on La Quina 5, Henri-Martin discovered its largely complete left ulna and radius in a sediment block associated with the partial skeleton (Fig. 1). The association with La Quina 5 is confirmed by the clean join of the left olecranon process [5] onto the proximal ulna. Described only in an unpublished manuscript by Henri-Martin [19, p 591], I measured them in 1973 in the Musée d'archéologie nationale. They were subsequently transferred to the Musée de l'Homme by H. Delporte. Given damage to the distal radius, the radial maximum length (≈ 224 mm) was estimated from the ulnar maximum length (242 mm) using a least squares regression based recent humans ($r^2 = 0.971$).



Fig. 1 Anterior views of the La Quina 5 right middle to distal humerus, the left proximal to middle humerus, the left ulna and the left radius. Scale in centimeters / *Vues antérieures du milieu de la diaphyse à l'extrémité distale de l'humérus droit, de l'extrémité proximale au milieu diaphysaire de l'humérus gauche, et des radius et ulna gauches, de La Quina 5. Échelle en centimètres*

although it may modestly underestimate the original ECV of La Quina 5. This ECV is indeed among the lower estimates available for the Neandertals (Fig. 2). The Neandertal values cluster into two size ranges, a large one with four male and four unsexed determinations and a small one with the Tabun 1 female, five unsexed specimens, and the

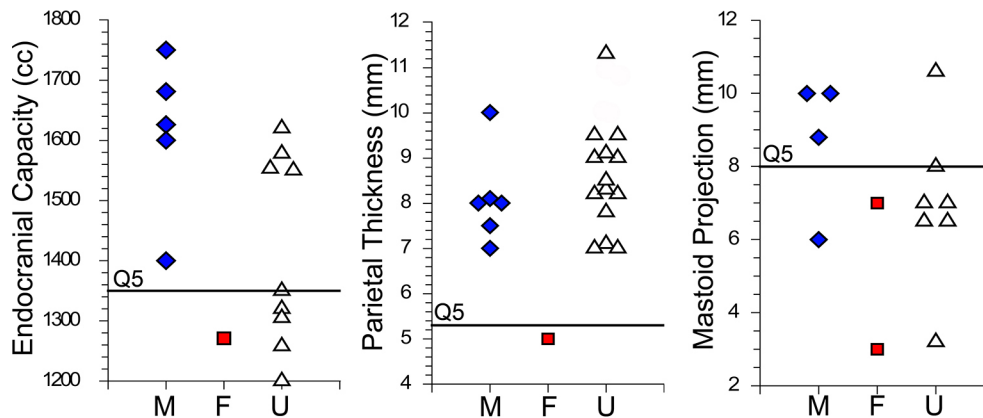


Fig. 2 Distributions of neurocranial measurements for male (M), female (F) and unsexed (U) Neandertals, plus La Quina 5 (Q5), including endocranial capacity (ECV), mid-parietal thickness, and mastoid projection from the digastric sulcus / *Distributions des mesures neurocrâniennes pour La Quina 5 (Q5) et des Néandertaliens mâles (M), femelles (F) et de sexe inconnu (U) : capacité crânienne, épaisseur pariétale et projection du processus mastoïde à partir de la rainure digastrique*

Feldhofer 1 male. The value of 1350 cc for La Quina 5 falls at the upper margin of the smaller group, slightly below the estimate of ≈ 1400 cc for Feldhofer 1. Given its proximity to the Tabun 1 value (which would probably be joined by the very small Palomas 96 female [31]), it is tempting to use it to indicate female sex. However, the small Feldhofer 1 ECV and the considerable variation, and possible error [38], in the estimations for the variably complete Neandertal crania limit the relevance of ECV for sex assessment.

The La Quina 5 endocranial cavity is vaulted by rather thin squamous portions for a Neandertal. Its parietal eminence thickness of 5.3 mm is below all of the other Neandertals except Tabun 1 (Fig. 2). Yet, both of these specimens have parietal thicknesses that are well below all of the other Neandertal parietal thicknesses. Their values are also below those of the two other La Quina parietal bones providing thicknesses at the eminence, La Quina 25 (7 mm), and 37 (7.8 mm), and at the bottom of the ranges of thicknesses of two other La Quina parietals (23a: 5–11 mm, 23c: 6–10 mm). Is a thin parietal bone a female feature for a Neandertal, or are La Quina 5 and Tabun 1 merely unusual for the group?

It is also possible to assess the projection of the mastoid process, a sexually dimorphic trait in recent humans [39]. The tips of both of the La Quina 5 processes are abraded, although the loss of bone should be ≈ 1 mm. The projection of the preserved portions of the mastoid processes from their digastric sulci (the height of Zoja) for La Quina 5 is ≈ 7.0 mm, the value provided by Vallois [40]. However, rounding out the missing portions of the mastoid process tips indicates original heights ≈ 8 mm and possibly >8 mm. This better estimate of the La Quina 5 mastoid process projection is among the larger of the Neandertal ones (Fig. 2). It is among the male values, above that of the male La Ferras-

sie 1, modestly above that of the female La Ferrassie 2, and distinct from the other female (Tabun 1, which is close to that of Forbes' Quarry 1). It is above those of La Quina 10 and 27 (both 6.5 mm). The mastoid projection of La Quina 5 is therefore among the male Neandertals.

The prominence and hypertrophy of the La Quina 5 supra-orbital torus and associated zygomatic bones were noted by both Hrdlička and Smith as appearing “male”. A comparison of toral lateral thickness (11.9 mm) (used rather than the middle thickness, given middle toral reduction in some Neandertals [35] and its connection to robust zygomatic bones [41]) places La Quina 5 adjacent to Tabun 1, but in the middle of the male distribution and at the upper end of the unsexed distribution (Fig. 3). The very thin values are Palomas 11 and the female Palomas 96, a sample noted for its diminutive tori [42]. Supraorbital toral hypertrophy does not appear to distinguish Neandertal sexes.

Mandibular Aspects

Henri-Martin and Hrdlička both noted the large dimensions of the La Quina 5 mandible, although they did not distinguish between size (or facial length) versus corporeal hypertrophy. When appropriately scaled, Neandertal mandibles are not particularly robust (the one exception being Kebara 2) [43], but they can be long [44]. For mandibular (hence facial) length, the measure available for La Quina 5 (mid-condyle to C_1/P_3 : 114 mm) places it among the longest Neandertal mandibles (Fig. 3); it is exceeded only by the Amud 1, La Ferrassie 1 and Shanidar 1 males, and approached by Saint-Césaire 1. It is far from the small Tabun 1 value, as well as those of Zafarraya 2 and the probably male Regourdou 1.

The measure of corporeal hypertrophy, an estimate of the polar moment of area at the mental foramen (Fig. 3), is

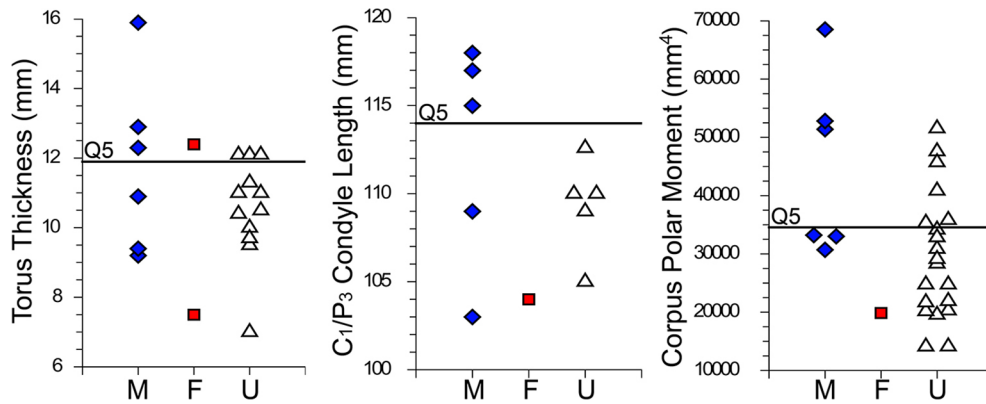


Fig. 3 Distributions of facial measurements for male (M), female (F) and unsexed (U) Neandertals, plus La Quina 5 (Q5), including lateral torus thickness, direct mid-condyle to C₁/P₃ alveolus distance, and the corpus polar moment of area at the mental foramen / *Distributions des mesures faciales pour La Quina 5 (Q5) et des Néandertaliens mâles (M), femelles (F) et de sexe inconnu (U) : épaisseur latérale du torus supraorbitaire, longueur mandibulaire du condyle à C₁/P₃ et le module de section polaire du corps au niveau du foramen mentale*

modest for a male Neandertals but nonetheless above the values of Amud 1 and Regourdou 1. It is in the middle of the overall Neandertal distribution and well above the Tabun 1 measure (the very high value is Kebara 2). Although among the male values, the value for La Quina 5 of 35,600 mm⁴ is close to an overall Neandertal mean of 33,200 mm⁴ ($\pm 13,300$ mm⁴, n = 26); it therefore suggests that its mandibular hypertrophy is sexually indeterminate.

Appendicular Aspects

The only reliable long bone lengths for La Quina 5 are for the combined right and left humeri and the left radius and ulna (Fig. 1). Although it has been suggested that the asymmetry in diaphyseal dimensions of the two humeri is pathological [5,14,34], the normality of the left forearm and the dimensional similarities of the right and left distal humeri imply that the diaphyseal asymmetry is due to differential arm use and not pathology; its level of asymmetry is high but not exceptional for a Late Pleistocene human [45]. The humeri were aligned using the deltoid and pectoralis major tuberosities, and lengths measured from the left head to the right distal articulations, for a maximum length ≈ 311 mm. The left radius has a maximum length, estimated from the left ulnar maximum length, of ≈ 224 mm (Fig. 1).

These maximum lengths place La Quina 5 either among the male values (humerus) or between the male and female ranges (radius) (Fig. 4). Its humerus length is very close to those of the La Chapelle-aux-Saints 1, Feldhofer 1 and Regourdou 1 males and distinct from the female values. The radius length, however, falls between the La Chapelle-aux-Saints 1 male and the Tabun 1 female values. Despite these differences in male versus female indications, its brachial index (72.0) is low but unexceptional for a Neandertal

(75.2 \pm 2.9, n = 10), above that of La Ferrassie 2 (69.9) and similar to that of La Chapelle-aux-Saints 1 (72.8). The comparison of its average humeral distal articular breadth (45.7 mm; right: 45.9; left: 45.5 mm) places it in the larger portion of the overall Neandertal distribution, among the males and distinct from the females (Fig. 4).

The La Quina 5 right humeral midshaft polar moment of area (18,000 mm⁴) is in the middle of the Neandertal distribution, among the smaller males, but distant from all three of the females (Fig. 5). Its right femoral mid-proximal diaphysis, however, provides a value (59,500 mm⁴) close to a larger female (La Ferrassie 2) but again in the middle of the overall Neandertal distribution (Fig. 5). It is also close to the value (56,800 mm⁴) of La Quina 38.

Discussion

These comparisons of the La Quina 5 cranial, mandibular, upper limb and femoral dimensions provide a mosaic of “male” versus “female” affinities relative to pelvically-sexable Neandertals and the overall Neandertal distributions. Despite a majority of past attributions of La Quina 5 to the female Neandertal sample, only two features argue in that direction: ECV and parietal thickness. For the former, the La Quina 5 value is nonetheless similar to the one for the distinctly male Feldhofer 1. For the latter, La Quina 5 and Tabun 1 are outliers from the rest of the Neandertals, questioning the utility of the measure for sex attribution.

La Quina 5 has a large mandible, as reflected in its distinctively “male” length, although its corporeal hypertrophy is only suggestive of “male” affinities. Its mastoid process projection is large, closest to those of the male Neandertals. All three of its humeral measures fall with the males and

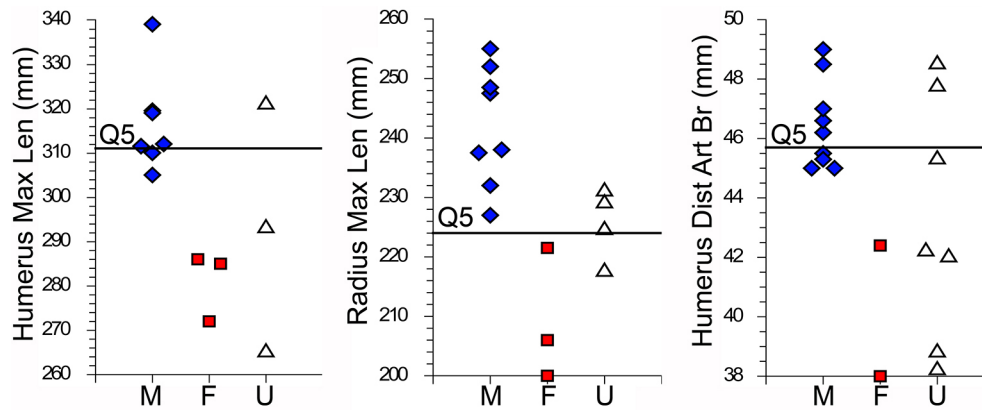


Fig. 4 Distributions of upper limb measurements for male (M), female (F) and unsexed (U) Neandertals, plus La Quina 5 (Q5), including humeral and radial maximum lengths and humeral distal articular breadth / *Distributions des mesures du membre supérieur pour La Quina 5 (Q5) et des Néandertaliens mâles (M), femelles (F) et de sexe inconnu (U) : longueurs maximales de l'humérus et du radius, et largeur des articulations distales de l'humérus*

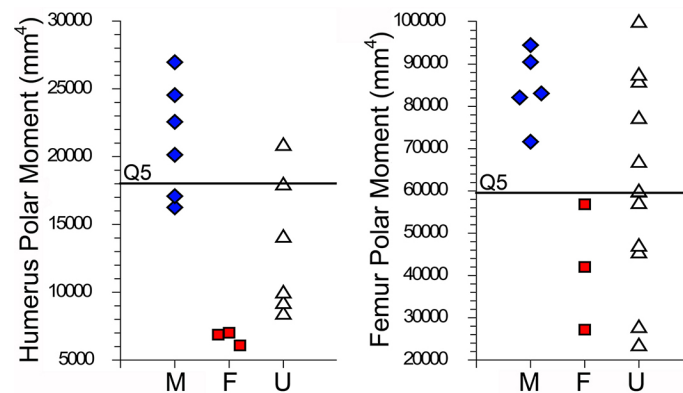


Fig. 5 Distributions of diaphyseal measurements for male (M), female (F) and unsexed (U) Neandertals, plus La Quina 5 (Q5) including humeral dominant arm midshaft (50%) and femoral mid-proximal shaft ($\approx 65\%$) polar moments of area / *Distributions des modules de section polaire pour le milieu diaphysaire de l'humérus et la diaphyse mi-proximale du fémur pour La Quina 5 (Q5) et des Néandertaliens mâles (M), femelles (F) et de sexe inconnu (U)*

distinct from the females. Yet, it is intermediate in lateral supraorbital torus thickness, radius length and femoral polar moment of area.

From these considerations, as noted by Smith [18] based on cranial features, it is difficult to consider La Quina 5 as female. Smith's and these considerations would argue for La Quina 5 being best viewed as either male or indeterminate in sex. Given the caveat of Verna [19] that the male-female variation of the original La Quina 5 population is unknown and one can only pool specimens across 1,000s of years and kilometers to create a reference sample, the latter inference is the cautious conclusion. However, these data should be sufficient to make the female status of La Quina 5 unlikely. They argue, in particular, against using La Quina 5 as part of the Neandertal female sample for comparative morphological and paleobiological assessments.

Conclusion

A reassessment of the cranial, mandibular and appendicular dimensions of the La Quina 5 Neandertal remains place into question its traditional (originally from Henri-Martin) consideration as female. The relevant dimensions of the partial skeleton are either of uncertain value, intermediate between Neandertal males and females, or among Neandertal males. It is conservatively considered as indeterminate as to its sex, although it appears more likely to be male.

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Links of interest: None.

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