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Stable isotope data from the early Christian catacombs of ancient Rome: new insights into the dietary habits of Rome's early Christians

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ABSTRACT

This study reports on the first attempt that determines the diet of a small but conceivably representative section of Rome's early Christian community by means of $\delta^{13}C$ and $\delta^{15}N$ measurements on collagen extracted from twenty-two samples of human bone. Samples derive from the Liberian Region in the catacombs of St. Callixtus on the Appian Way—an area that has been radiocarbon dated to the period from the mid-3rd through early 5th century AD. Comparing our results to those produced for several other sites, we argue that this population's typical diet included freshwater fish. We also briefly discuss breastfeeding and the freshwater reservoir effect, to then explore the dietary, art historical, and possible sociological ramifications of our results.

1. Introduction

Although first applied in the late 1970s (Van der Merwe and Vogel, 1977), stable isotope analysis did not become a major tool in the study of palaeodiet until the early 1990s (Schwarcz and Schoeninger, 1991; Katzenberg and Harrison, 1997). One particularly important reason why the investigation of stable isotope ratios impacts current work in food history so profoundly is that it allows one to determine the food intake of specific individuals or specific populations whose dietary habits would otherwise remain hidden. This explains why, in less than two decades, the study of stable carbon and nitrogen isotopes as tracers of foodstuffs has revolutionized our understanding, not just of the dietary habits of prehistoric populations worldwide (Drucker and Bocherens, 2004; Sponheimer et al., 2006; Homes Hogue and Melsheimer, 2008), but also of such diverse historic civilizations as the ancient Greeks (Keenleyside et al., 2006), the Romans (Prowse et al., 2004, 2007), the inhabitants of the Byzantine Empire (Bourbou and Richards, 2007) and a variety of Medieval populations (Polet and Katzenberg, 2003; Müldner and Richards, 2005, 2007a,b; Salamon et al., 2008).

One historic group has remained beyond the purview of stable isotope analysis so far: Rome's early Christians. There are two reasons why this is not surprising. First, much historical research into the origins of Christianity deals with what the first Christians did *not* eat as it continues to focus on one of the most outstanding societal shifts in Roman history, namely the rise of asceticism—a severe form of renunciation that manifested itself particularly strongly in the areas of food and sex (Brown, 1988; Clark, 1999; McGowan, 1999). Secondly, early Christian archaeology, especially in Rome where the archaeological evidence is most plentiful, has been slow to adapt to the new possibilities offered by science-based archaeology, preferring a more traditional art historical and descriptive approach instead. As a result of these two emphases, we do not know whether Christianity made a difference in terms of what people normally ate. It is evident that a majority of early Christians did not practice an ascetic lifestyle. It is also clear that

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some ascetics may have had access to a significantly more varied diet than the more staunch ecclesiastical defenders of this practice would have us believe—paleobotanic evidence from Egypt, for example, clearly points into that direction (Rutgers, 1998) as do stable isotope studies on the skeletal remains of early Belgian saints (Van Strydonck et al., 2006).

The current investigation is the first attempt to use evidence from the early Christian catacombs of ancient Rome to write food history whilst performing δ^{13}C and δ^{15}N measurements on collagen extracted from human bone. It arises out of a larger project in the Jewish and early Christian catacombs of Rome that seeks, amongst other things, to determine the chronology of these catacombs through radiocarbon dating and that, in the process, also needed to address the issue of a possible fresh- or seawater reservoir effect (Rutgers et al., 2002, 2005, 2006, 2007).

The catacombs of Rome are enormous subterranean cemeteries (Pergola, 1997; Rutgers, 2000; Fiocchi Nicolai, 2001). They were used for burial from the second through the early fifth century AD and contain the earliest remains of Christians that can be identified as such. With an estimated total of 500,000 tombs, surprisingly little work has been done in the areas of historical demography and physical anthropology (Mancinelli and Vargiu, 1994; Rutgers, 2006; Blanchard et al., 2007).

Our samples derive from the Liberian Region in the Christian catacomb of St. Callixtus. The catacomb of St. Callixtus on the Appian Way is one of the largest early Christian catacombs (De Rossi, 1864–1867). It originated in the early third century AD through papal intervention as cemetery for the Christian poor (Fiocchi Nicolai and Guyon, 2006). Soon after, other subterranean areas were added, including the so-called Liberian Region (Fig. 1). This region, which has been radiocarbon dated to the period from the mid third through early fifth century AD (Rutgers et al., 2005, 2007), consists of an intricate network of underground galleries into the side-walls of which simple shelve graves (*loculi*) have been cut in sheer endless piles, with up to eight graves per pile, on both sides of each individual gallery. In addition, flanking the Region's central portion, an impressive series of monumental burial chambers (*cubicula*) have been hollowed out into the volcanic soil, each containing up to fifty graves as well. These architectural features justify the conclusion that the Liberian Region marks a transitional phase during which early Christianity in Rome transformed from a closely knit minority religion to a much more loosely arranged, but numerically strong force.

The principles on which stable carbon and nitrogen isotopes analysis is based are known well enough (Mays, 1998; Schwarcz, 1991; Sealy, 2001; Privat et al., 2002; Le Hurray et al., 2006) and do not require further elaboration here. Of course, this is not to say that current methods and working hypotheses are no longer evolving or that they escape scrutiny (Hedges and Reynard, 2007). In addition, we would like to recall that stable isotope analysis of the type performed here provides information relating to long-term food intake only.

2. Materials and methods

2.1. Samples

As is evident from their identifiers, samples were gathered throughout the Liberian Region (Table 1). Eleven samples were obtained from simple *loculus* graves. Eleven further samples derive from *loculi* located in a set of more monumental *cubicula*. The particular nature of the *loculi* graves—shelve graves that are separated from other such graves on all sides by means of a substantial layer of tuffa-rock—guarantees that our samples derive from 22 individual graves. While all graves in the Liberian Region have been broken into at some time in the past by looters, we selected only those graves for analysis where the effects of looting could be shown to not have significantly disturbed the original configuration of the burial. Identifiers in Table 1 specify a sample's exact location in the catacomb. As an example, sample A3-N-XIV-2 derives from a grave on the North side of gallery A 3, fourteenth row of graves from the main entrance gallery H1, second

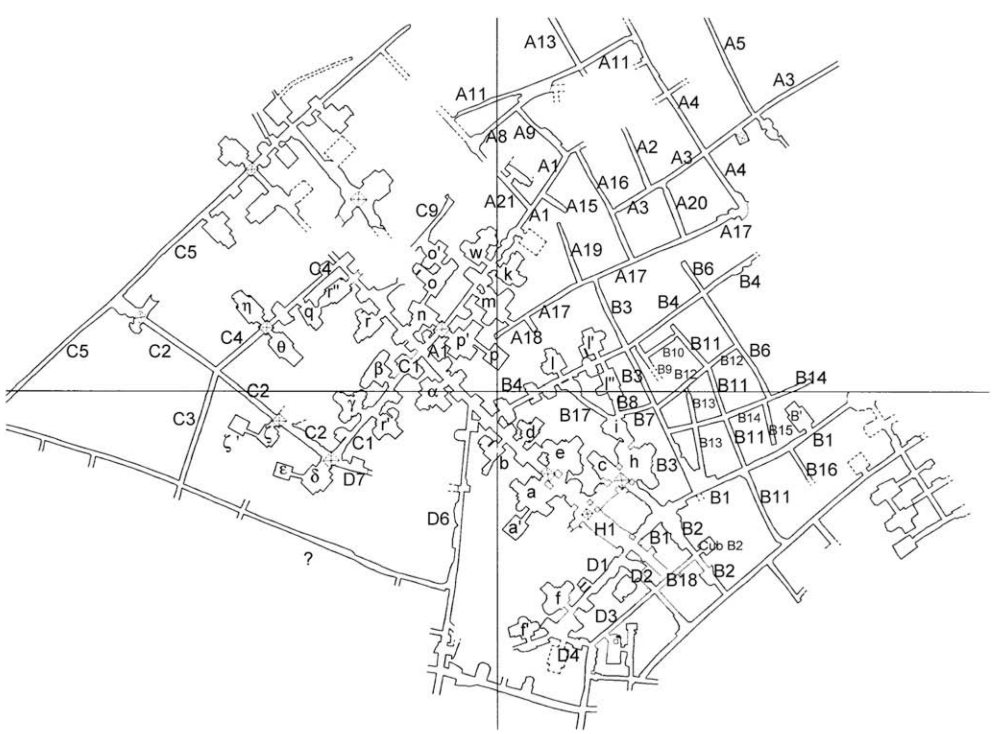

Fig. 1. Plan of the Liberian Region of the catacombs of St. Callixtus with designation of individual galleries and burial rooms.

Table 1
Isotopic values of bone samples derived from the Liberian Region. Shaded cases indicate low collagen yields. The radiocarbon samples have been calibrated by OxCal v3.10 (Bronk Ramsey, 1995) using the atmospheric data from Reimer et al. (2002). ^{14}C samples were prepared at the Royal Institute for Cultural Heritage, Brussels, and measured at the Leibniz Labor für Altersbestimmung und Isotopenforschung, Christian-Albrechts-Universität, Kiel, Germany.

Grave number	Age at death [years]	Bone	δ^{13}C PDB	δ^{15}N AIR	C:N	Collagen yields %	Lab. # and ^{14}C age [BP]	2σ-Calendar age [year]
A3-N-XIV-2	Adult	Foot phalanx	−20.2	9.7	3.2	5.1		
A3-Z-I-1	±6	Radius	−20.2	11.0	3.3	0.9		
A11-N-X-4	Adult	Foot phalanx	−19.9	10.5	3.2	1.9		
A20-O-IV-3	Adult	Foot phalanx	−19.4	11.0	3.2	12.9	KIA-28751: 1770 ± 25	130–350 cal AD
A20-W-IV-3	Adult	Foot phalanx	−19.5	10.8	3.2	20.9		
B6-W-IV-5	9	Hand phalanx	−20.3	10.4	3.2	14.6	KIA-28785: 1825 ± 25	120–260 cal AD
B6-O-IV-3	8	Foot phalanx	−19.9	10.1	3.2	14.5		
B13-O-IV-3	13 or 8	Foot phalanx	−20.8	11.9	3.6	1.4	KIA-28786: 1745 ± 30	220–390 cal AD
B14-Z-III-	6	Foot phalanx	−19.8	10.6	3.2	11.3		
D9-W-XVI-8	2; Breastfed baby	Foot phalanx	−18.5	13.5	3.2	4.2		
D9-O-XIX-5	Adult	Femur	−19.9	10.6	3.2	17.3	KIA-28784: 1750 ± 25	230–390 cal AD
Cubiculum P′-b-4	82–85	Foot phalanx	−19.0	10.4	3.3	8.1		
Cubiculum P′c Right of arcosolium	29–31	Foot phalanx	−20.2	10.3	3.2	5.3		
Cubiculum P′-c Left of arcosolium	Adult	Foot phalanx	−19.6	10.3	3.3	9.6		
Cubiculum P-a-2	Adult	Foot phalanx	−19.1	10.3	3.3	13.5		
Cubiculum P-b-4	Adult	Foot phalanx	−20.2	10.2	3.2	17.5		
Cubiculum P-b-2	Adult	Patella	−19.9	10.6	3.2	13.3		
Cubiculum P-P′-east-2	Adult	Hand phalanx	−19.9	11.0	3.3	4.5		
Cubiculum P-P′-east-3	Adult	Foot phalanx	−20.0	11.8	4.2	1.0		
Cubiculum P′-b-10	Adult	Foot phalanx	−19.7	11.0	3.2	1.6		
Cubiculum P′-b-11	Adult	Foot phalanx	−18.9	10.0	3.3	5.9		
Cubiculum P′-a-4	Adult	Foot phalanx	−19.6	11.5	3.4	1.3		

PDB = Peedee belemnite.
AIR = Atmospheric nitrogen.
BP = before present.

grave from the top. Samples from *cubicula*—such as Cubiculum P′-b-4—likewise count graves from ceiling to floor, and include a reference to the respective wall, with "a" being the wall facing the entrance, "d" being the entrance wall, and walls "b" and "c" being the walls to the right and left of the *cubiculum* (while entering the chamber and facing wall "a") respectively.

Bone preservation was generally extremely poor, making sexing by means of the usual physical anthropological methods impossible in virtually all cases. Whenever possible, aging was achieved through the Tooth Cemental Annulation Technique (Maat et al., 2006). More generic indicators (adult, subadult) are included in those cases where a more precise type of aging was no longer possible. Collagen was mostly extracted from foot phalanxes (Table 1). Collagen yields differed quite considerably per sample. We suspect the catacomb's microclimate as well as a sample's specific location to be important factors in bone and collagen preservation. The catacomb's climate is rather constant all year round, with humidity and temperature levels that are always fairly high (around 17 °C). This affects bone and collagen preservation negatively. In addition, we also noticed that those graves in which parts of the original sealing *loculus*-slab still remains *in situ* generally have better osteological materials than those where robbery resulted in the total removal of a tomb's closure. Such observations are consistent with evidence from other archaeological sites. There too, a warm climate combined with the absence of protective encasements such as sarcophagi results in poor collagen preservation (Iacumin et al., 1998).

2.2. Collagen extraction and stable isotope analysis

Samples were prepared at the Royal Institute for Cultural Heritage, Brussels. The collagen was extracted using the Longin method (Longin, 1971). Stable isotopes and C:N were measured on a Thermo Finnigan delta + XL (continuous flow type), interfaced with a Flash EA1112 elemental analyzer via a Conflo III interface. Both elements were measured together and a helium-dilution was applied for carbon as the amount of C is far in excess of the amount of N. Analytical precision was greater than 0.5‰ for both elements, as determined by duplicate measurements.

2.3. Radiocarbon dating

Four samples were sent for radiocarbon dating to the Leibniz Labor für Altersbestimmung und Isotopenforschung, Christian-Albrechts-Universität, Kiel, Germany. The purpose of performing radiocarbon dating in conjunction with stable isotope analysis was to reflect on the possibility of a fresh- or seawater reservoir effect.

3. Results

3.1. Freshwater fish and social stratification

According to Prowse et al. (2004) bad collagen preservation, resulting in a low collagen yield, may cause a δ^{13}C shift. Although our data do not show a correlation between yield (wt.%) and δ^{13}C (Fig. 2), we still believe it to be appropriate to depict the results for samples with a collagen yield below 4% separately in Fig. 3. This figure indicates that a certain dietary variation characterizes the food regime of the population under study. Still, with δ^{13}C values ranging from −18.9‰ to −20.8‰ (average −19.8 ± 0.4‰) and δ^{15}N values of 9.7–11.9‰ (average 10.6 ± 0.8‰), it confirms that the people buried in the Liberian Region of the St. Callixtus catacomb form a single population, suggesting that, by and large, these people had access to the same kind of food resources. Only sample

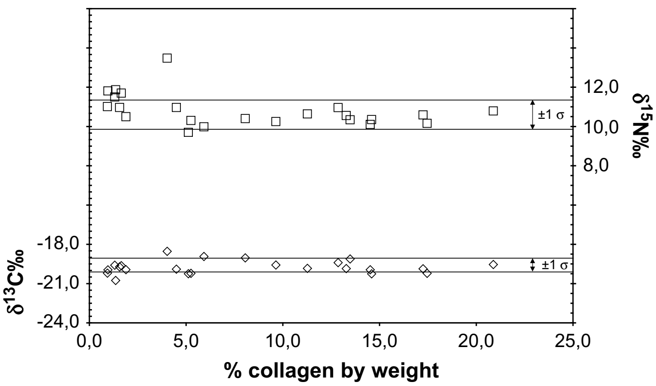

Fig. 2. δ^{13}C and δ^{15}N values in relation to the collagen recuperation rate.

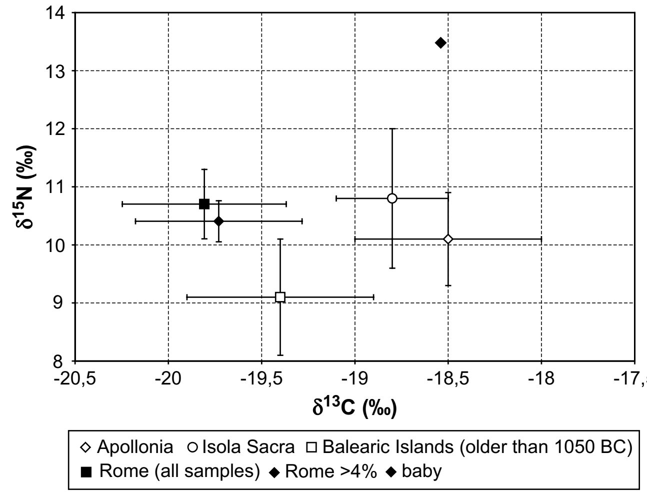

Fig. 4. Comparison of δ^{13}C and δ^{15}N values at several Mediterranean sites.

(D9-W-XVI-8) with comparatively heavy δ^{13}C and relatively high δ^{15}N values stands out. It probably represents a breastfed baby. It has not been included in the ranges and averages that appear in Fig. 4, but will be discussed separately.

Fig. 4 seeks to determine the nature of the food regime by comparing our evidence to stable isotope evidence from three other archaeological sites in the Mediterranean. Unfortunately, there are no data from the domesticated animals used by the people buried in the catacombs that could be used as a reference. Futhermore, comparing stable isotope data from different regions, ecosystems, and periods can be problematical, but we are convinced that there are no important local differences between the reference sites since Isola Sacra is close to Rome and the data from domesticated animal remains from the 3 reference sites (Isola Sacra, Appolonia and the Balearic Islands) are the same within statistical limits (Table 2). As already indicated, the breastfed baby was not used while calculating the averages in Fig. 4 inasmuch as that particular sample must be considered one trophic level higher than the rest of the data.

Evidence from the Balearic Islands dating to the Chalcolithic and Bronze Age Periods (>1050 BC) documents a 100% terrestrial diet without any C4 pathway plants (Van Strydonck et al., 2005). Data from Apollonia—a fifth through second century BC Greek colony on the Black Sea (Keenleyside et al., 2006)—as well as data from Isola Sacra—a first through third century AD necropolis belonging to Portus, the port of Rome (Prowse et al., 2004)—point towards a mixed diet of terrestrial and marine foods. On average the samples from the Liberian section are lighter in δ^{13}C than the

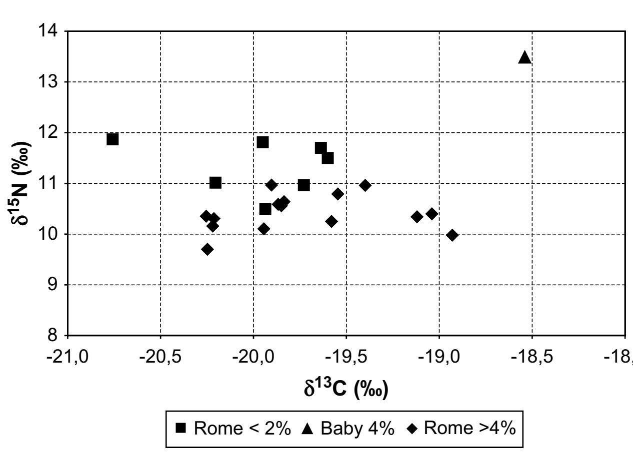

Fig. 3. Scatter plot of δ^{13}C and δ^{15}N of samples from the Liberian Region in the catacombs of St. Callixtus on the Appian Way.

reference groups cited here, comparable to Apollonia and Isola Sacra in δ^{15}N, but heavier in δ^{15}N than the Balearic group. This excludes a large consumption of C4 plants or marine food. A pure terrestrial diet, however, is not only in disagreement with the Balearic data, but also with the expected isotopic shift between the domesticated animal data of the region and the human bones.

It is likely that relatively high δ^{15}N values in combination with lower δ^{13}C values indicate the consumption of freshwater fish (Lanting and Van der Plicht, 1995/1996, 1998; Hedges and Reynard, 2007). The Rome δ^{15}N values are roughly similar to those at the Late Bronze and Early Iron Age site of Chicha in Western Siberia (fourteenth to twelfth century BC), where relatively high δ^{15}N values correlate with high δ^{34}S values indicative of freshwater fish consumption as dietary staple (Privat et al., 2007). The Roman data are also similar to Mesolithic evidence from Iron Gates section of the Danube River, where the aquatic protein contribution falls into a 20–43% range (Cook et al., 2001; Bonsall et al., 2001), and to data from Mesolithic Denmark (Fischer et al., 2007).

In an attempt to calculate the relative proportion of aquatic food to a given diet, Cook et al. (2001) propose a simple linear model that operates on the notion of a completely terrestrial diet with a δ^{15}N value of 8‰ and a completely aquatic diet in the range of 17‰. Applying this model to the evidence from Rome, it follows that the contribution of freshwater fish to the diet of the early Christians there ranges between a minimum of 18% and a maximum of 43%, with a mean average of 29.5% (the breastfed baby has been excluded from these calculations). It should be noted, however, that feeding experiments have demonstrated that the supposed endpoint of a pure terrestrial diet can vary according to the complexity of the diet (Van Strydonck et al., in press). The mixing model has, therefore, to be applied with much care. Even so, the

Table 2
δ^{13}C and δ^{15}N values from domesticated animals from the reference sites.

Site	δ^{13}C ‰	δ^{15}N ‰	Reference
Isola Sacra	Ca. -20.72 ± 81	Ca. $+5.13 \pm 1.37$	5 Cows and 1 goat (Prowse et al., 2004, Fig. 2)
Appolonia	-20.6 ± 0.1	$+5.2 \pm 0.26$	Based on 2 sheep, 1 goat, 1 ungulate (Keenleyside et al., 2006)
Balearic Islands	-20.41 ± 0.75	$+5.44 \pm 1.77$	76 Samples from domesticated animals (no dogs) (Van Strydonck et al., 2005)

data suggest that while freshwater fish must have been an important source of protein intake for early Christians in Rome, it supplemented a diet that was otherwise essentially terrestrial in nature. The general absence of teeth with heavy occlusal attrition, with occlusal surfaces showing slight or moderate attrition only, supports the results of our stable isotope analysis to the extent that this population's diet can be said to have comprised but few abrasive foods.

The evidence from Rome is too sparse to draw conclusions on differences in diet that are age-related, let alone to determine whether there existed sex differences in dietary behavior. It is possible, however, to reflect on questions of social stratification inasmuch as samples from simple *loculus* graves in sections A, B, and D of the catacomb may be hypothesized to relate to a financially less secure stratum than those deriving from the architecturally more monumental *cubicula* P and P′. When we calculate the mean values for the *loculi* as opposed to mean values for the *cubicula*, it follows, however, that these are not statistically significant—with δ^{13}C being −19.99‰ for the *loculi* and −19.64‰ for the *cubicula*, and δ^{15}N being 10.66‰ for the *loculi* and 10.67‰ for the *cubicula* respectively. In terms of food intake, there are, therefore, no tangible differences between individuals buried in *loculi* and those that found their final resting place in *cubicula* P and P′.

3.2. Breastfeeding

Using TCA, one sample (D9-W-XVI-8) could be shown to have belonged to an individual whose age at death was two years of age. This sample is remarkable in that it displays a relatively heavy δ^{13}C (−18.45‰) and high δ^{15}N values (13.48 ‰). Although we have no associated mother, it is evident that regular δ^{15}N values within the catacomb's population are much lower, i.e. somewhere in the 10–11‰ range, as in the case of two six-year olds (A3-Z-I-1 and B14-Z-III). Their levels, in turn, correspond well to two adults who passed away while in their early thirties and early eighties respectively (Cub. P′-c and Cub. P′-b-4).

It is well known that children that are being breastfed are one trophic level above their mother or the rest of a given population (Fogel et al., 1989; Privat et al., 2002; Fuller et al., 2006), the trophic level effect being on average ∼3‰ in δ^{15}N (Dupras and Tocheri, 2007). Our sample conforms to this pattern. While sample D9-W-XVI-8 may perhaps therefore be considered a two-year old that was still being breastfed, it is furthermore conceivable that this child was not yet exposed to weaning in any systematic fashion. During weaning δ^{15}N values start to descend again to maternal levels and δ^{13}C values probably also begin to shift (Fuller et al., 2006; Dupras and Tocheri, 2007). It should be noted, however, that this is a process that takes some time to translate itself into the child's collagen.

Although, obviously, a single piece of evidence does clearly not suffice to reconstruct the infant feeding practices of Rome's early Christians, it is interesting to note that our sample seems to hint at cultural continuity: pagan medical authorities such as Galen, the people of pagan Isola Sacra (Prowse et al., 2004), the users of the Kellis 2 cemetery in the Dakhleh Oasis in Egypt, which is possibly a Christian necropolis (Dupras and Tocheri, 2007), as well as a Late Roman population at Queensford Farm in England, whose religious allegiance is a matter of dispute (Fuller et al., 2006), all seem to have gradually weaned their children when these were between two and four years of age. Such ancient evidence contrasts notably with stable isotope data from the medieval village of Wharram Percy in England where weaning appears to have occurred earlier, between one and two years of age (Mays et al., 2002).

3.3. Radiocarbon dating and the freshwater reservoir effect

Human bone is the single most commonly occurring organic material available for radiocarbon dating the catacombs of ancient Rome. For catacomb chronologies to be based on an AMS dating of such skeletal materials, it is crucial to know whether ^{14}C depletion is a factor that needs to be taken into account, especially since it is not unusual for a freshwater reservoir effect to introduce errors of 300–500 ^{14}C yr (Cook et al., 2001; Culleton, 2006; Fischer et al., 2007).

Four samples, all belonging to people with an estimated aquatic food intake of over 25%, were sent off for radiocarbon dating. The results dovetail nicely with a series of previously performed AMS dates on human bone collagen, i.e. collagen on which no stable isotope analysis was carried out (Fig. 5). While the bone samples' 2σ calibrated ages are uniformly consistent with an early fifth century AD upper chronological limit that is confirmed by archaeology, their lower limits seem somewhat more problematical. Eleven out of sixteen samples from the Liberian Region have lower limits that predate the catacomb's historically established papal founding around 200 AD. With their lower limits being in the 130s AD and the Liberian Region probably not originating prior to 250 AD, the lower limits of these samples is at least 120 calendar years too early. This leads to the conclusion that, although balancing on what is statistical justified, it seems that the radiocarbon dataset is somewhat too old compared to the historical records.

Fischer et al. (2007) propose a method to correct the reservoir effect based on the assumption of a freshwater effect of 400 years and that effectuates reservoir age correction by considering Cook's linear δ^{15}N model discussed earlier as a percentage of those 400 years. The choice of a 400 year reservoir effect is based on the assumption that the river water was not aged by dissolved geological calcium carbonate or affected by other geological phenomena like the admixture of glacier melt water, because those phenomena could cause reservoir ages up to 2000 or even 4000 years (Lanting and Van der Plicht, 1998). Applied to our four samples, this results in a reservoir correction that ranges between 108 yr ^{14}C BP and 172 yr ^{14}C BP, with a mean average of 132 yr ^{14}C BP.

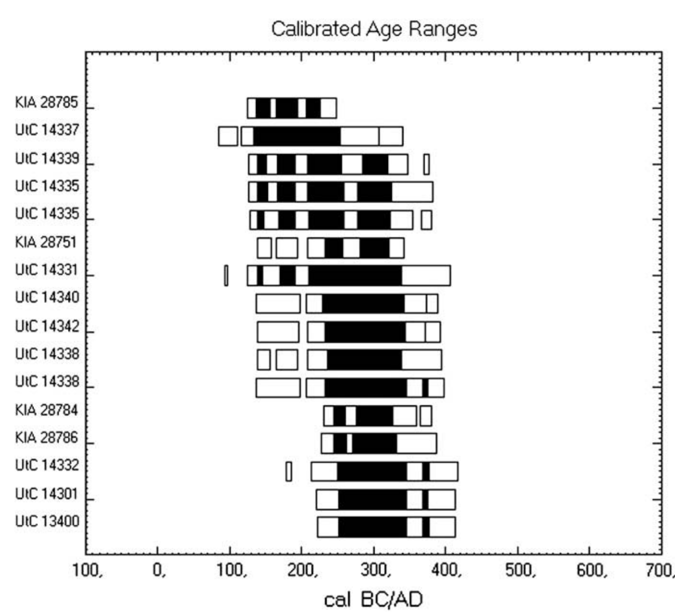

Fig. 5. 1σ (open) and 2σ (closed) calibrated dates of human bone from the Liberian Region in the catacombs of St. Callixtus, generated using Calib Rev 5.0.1. Stable isotope analysis was performed on KIA numbers only. UtC samples derive from Rutgers et al. (2005,2007).

4. Discussion

4.1. Early Christian diet and early Christian social origins

While distancing themselves from Jewish food taboos and generally avoiding meat derived from pagan sacrifices, the early Christians are normally hypothesized to have eaten the same food as their non-Christian Roman contemporaries (Klauser, 1966). This means that they would have consumed such staple goods as cereals, oil, wine, and, especially from the third century onwards, some pork (Garnsey, 1991b; MacKinnon, 2004). In the city of Rome all these products were available to a substantial portion of the population through an elaborate system of state subsidies (Herz, 1988). This system continued to function throughout the period during which the Liberian Region in the catacombs of St. Callixtus was used for burial. While it is not clear whether Christians participated in named food-distributing arrangements on any substantial scale, the stable isotope evidence presented in this contribution documents quite clearly that the diet of Rome's early Christians included, in any event, an important protein supplement in the form of freshwater fish. Within the larger context of what is currently known about Roman dietary habits, the inclusion of freshwater fish in the diet of Rome's early Christians therefore comes unexpected and raises questions about the social origins of Christianity as well.

On the basis of isolated bits and pieces of information culled from the ancient literary sources it is normally assumed that fish was not a major component of the Roman diet (Garnsey, 1991a,b). When Romans ate fish at all, then they are normally believed to have consumed sea fish—at inland sites such as Rome or elsewhere (Richards et al., 1998) because they could afford it, and at seaside sites such as Isola Sacra because it was freely available (Prowse et al., 2004, 2005). Even though writers as chronologically far apart as first century BC Varro and fifth century AD Macrobius (III.16.12) praise the Tiber for its fish, and although the practice of raising fish in fishponds also became widespread from early imperial times onwards (Higginbotham, 1997), freshwater fish has not been considered by recent scholarship as an essential ingredient in the classical Roman diet. The results of our stable isotope analysis indicate that this view now needs to be nuanced. Incidentally, while we have not been able to pinpoint the origin of the freshwater fish consumed by the population under study, it may reasonably be assumed that this fish came from the Tiber.

The Edict on Prizes issued by the emperor Diocletian in 301 AD (*Edict of Diocletian* V.1–5) indicates that throughout the later Roman Empire state officials tried to fix the cost of freshwater fish to a price that amounted to half and, in the case of second-rate quality, to one third of its marine equivalent. Even though this cannot be taken to mean that freshwater fish was therefore cheap, there is good contemporary evidence pointing in precisely that direction. Late antique writers such as Libanius (*Oration* XI.254) observe that in the eastern part of the Roman Empire even the poor could eat fish as long as they satisfied themselves with specimens of riverine origin. Such a view echoes what had long been common knowledge in the city of Rome itself too. Thus, in the second century, Galen had deemed it necessary to advice against eating fish from the insalubrious Tiber—a practice that seems to have been widespread and that had gained its popularity specifically from the fact that such fish cost next to nothing (Nutto, 1995). Evidently, going out to the banks of the river and catching it oneself must have provided one with fish that was cheaper still.

Combined with our stable isotope results these observations allow us to conclude that the at least the small selection of early Christians analyzed in this article were all simple folk: they derived a sizeable of their protein from freshwater fish—fish that, clearly, was freely available to all, even to those with a small purse or in the possession of good fishing gear. One would dearly like to know whether the diet of early Christians at Callixtus is any way typical or not. The combined fact that our samples all consistently point into the direction of a major protein intake from riverine fish while deriving from graves located in very different locations in the catacomb suggests that this may very well turn out to have been the case. It hardly needs stressing, however, that to fully answer this question further research in other catacombs and on a significantly larger scale that was possible here, is necessary. Ideally such research should concurrently also address the question of whether these early Christian diets differed from those of non-Christian groups of Rome in general, and the poor in particular. This means that future research should aim at gathering isotope data for that latter group as well. Future research should finally also seek to procure data on local faunas so as to properly contextualize the results of our $\delta^{13}C$ and $\delta^{15}N$ measurements.

4.2. Early Christian art and religious practices

Representations of fish were a particularly powerful symbol in early Christian art (Jastrzebowska, 1979). Fish was also persistent feature in early Christian ritualistic behavior. In the art of the early Christian catacombs of Rome, representations of "fish on the table" (Fig. 6) occur frequently. These representations have given rise to a variety of theories that are believed to be mutually exclusive and that claim that these Christian representations are either always deeply symbolical and refer to Jesus (ΙΧΘΥΣ), or that they are more generally Eucharistic, or, instead, that they should be considered as purely secular and relate to the traditional commemorative meal in honor of the dead (Engemann, 1969; Vogel, 1976; McGowan, 1999; Gambassi, 2000).

The results of our stable isotope analyses now suggest that the religious and the secular were probably intertwined: fish was not just represented because it had a deeper symbolical meaning only, its recurrence also reflects a concrete reality with freshwater fish being a regular item on the menu of Rome's early Christians. Unfortunately, the actual representations in the catacombs (Fig. 6) are too generic to permit identification on the level of the individual species included. Even so, the general appearance of the fish that occur in early Christian wall paintings suggests that freshwater fish may very well have been the direct source of inspiration for those who painted them.

In early Christianity, fasting was particularly associated with asceticism as it was practiced by both men and women who

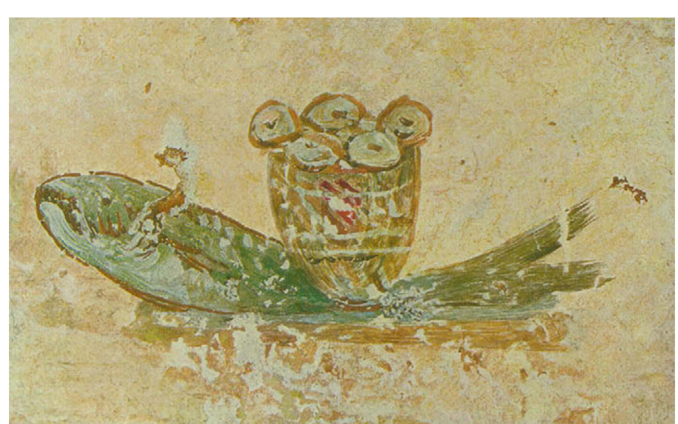

Fig. 6. Early Christian wall painting from the catacombs of St. Callixtus, representing fish and bread basket.

withdrew from society to live as monastics of either the hermitic or Pachomian type. In non-ascetic circles, however, fasting was not unknown either, starting to emerge in the early second century AD. Throughout antiquity, Church Fathers remained divided over the question of whether a true fast entailed the elimination of meat only, or whether the consumption of fish should be forbidden as well, several of them considering even fish as too festive a dish (Dölger, 1910–1943; Arbesmann, 1969). It is only in the time of Paulus Diaconus (725–799 AD) that a view was no longer challenged according to which fish was permitted in fact to replace meat during fasts, but it was not until the year 1000 that new fishing methods, better ways of fish preservation, and the emergence of commercial fishing on sea enabled tangible sections of Europe's Christian population to begin putting the age-old fasting ideology of the church into actual practice (Barrett et al., 2008; Salamon et al., 2008).

In the particular case of the stable isotope evidence from the catacombs of Rome, the regular consumption of fish that does not seem to have cost too much, as well as the absence of a fully and uniformly developed ecclesiastical ideology on fasting, prompts the conclusion that in the case of this particular population pragmatic considerations are likely to have outweighed religious ones in the choice of diet: Rome's early Christians ate fish, first and foremost, because it was freely available.

5. Conclusions

The results of our stable isotope analyses of the eating habits of Rome's early Christians are more complex than has traditionally been assumed. The evidence presented in this article clearly does not suffice to draw definitive conclusions regarding the typical eating habits of Rome's early Christians as a whole. Still, because our samples do not derive from a single row of interconnected graves but rather were selected randomly and, as such, originate from individual graves that are spread out over an area of no less than 15,000 m^2, they may nonetheless represent more of a cross-section bearing on general food patterns that the small number of samples analyzed would otherwise make reasonable to suppose.

Our analysis shows that the diet of a very small selection of early Christians buried at St. Callixtus was simple, suggesting that the inclusion of freshwater fish is indicative of a relative lack of wealth rather than of religiously motivated ascetic behavior. Our results also show that there was no difference in the diet between those buried in simple *loculi* as opposed to those interred in the more monumental *cubicula*. This is not surprising: while the *cubicula* of the Liberian Region in St. Callixtus can be architecturally imposing, they have hardly ever been decorated with pictorial decoration, and thus point towards a social stratum that was clearly not wealthy enough to engage in a dietary lifestyle that differed fundamentally from the people buried in the unpretentious *loculi* located in the direct vicinity of these *cubicula*. Evidence on diet and evidence from the architecture of the catacombs thus go hand in hand.

In this way our results provide, in their own way, independent evidence that goes towards supporting of the traditional hypothesis about the rise of Christianity (Meeks, 1984): even in the fourth century many of the people buried in the largely unassuming tombs of the Christian catacombs of ancient Rome were still typically poor. Such an observation helps to understand why Christianity could so rapidly gain the popularity it did: Christianity was not just a new faith, it specifically held the promise of providing those with little or no connection in society with an alternative social system. The huge Christian catacombs of Rome that originated through papal intervention following Jewish prototypes (Rutgers et al., 2005) are in fact a prime example of both the extent and effectiveness of such an alternative social system.

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