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THE ALPS – A BARRIER OR A PASSAGE FOR CERAMIC TRADE?

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The Alps as a barrier: ceramic remnants of the so-called Laugen-Melaun culture (11th c. to 6th c. BC) can be found in northern Italy (Trentino/Alto Adige) – Eastern Switzerland – Liechtenstein and Western Austria. A petrographic study of 454 shards from this area covering a time span of 500 years reveals: (1) that the pottery from the Trentino/Alto Adige contains a predominantly volcanic temper, which can be linked to the volcanic rocks of the Bolzano area, i.e. the core region of this culture. This material is therefore of a local/regional production; (2) that these ceramics were imported from the Bolzano region to South-Eastern Switzerland (Inn valley) and that the amount of imported pottery decreases markedly form the 11th c. BC (approximately 70% import) to the 7th - 6th c. BC (approximately 10% import) and (3) that no imported pottery can be detected north of the Alpine crest in Switzerland, Liechtenstein and Austria and that in this region serpentinite temper was preferred by ancient potters. These results demonstrate that long lasting contacts and ceramic trade existed between the populations of the Inn valley and the Trentino/Alto Adige. Such contacts could have been motivated by intermarriages between the two populations and/or economic exchange. The potters north of the Alpine ridge adopted the Laugen-Melaun style and produced such pottery locally. The use of serpentinite temper is puzzling and not related to any technological advantage (recycled material? Socio-cultural specificity?).

The Alps as a passage: 59 fragments of a black gloss ware, the so-called Campana, unearthed in eleven Late Latene sites (2nd - 1st c. BC) in Switzerland and neighbouring Germany were analysed chemically by X-ray fluorescence. The results revealed: (1) that all of them were produced either in Italy or Lyon and then exported to the north; (2) that two principal south-north exchange routes existed, (a) fluviatile, along the Rhone-Rhine corridor and (b) transalpine, using the Alpine passes, such as the Simplon and the Grand St. Bernard.

Key words: CERAMICS, LAUGEN-MELAUN, CAMPANA, ALPS, TRADE, RHYOLITE , SERPENTINITE

INTRODUCTION

The Brixen conference motto “The linking role of the Alps in past cultures”, evokes questions about the role of the Alps in ceramic trade: did they represent a hindrance or a significant, yet surmountable obstacle? In order to illustrate this, two examples will be presented in the following. Based on mineralogic-petrographic analysis, one case will argue for the Alps as a barrier. In the other example, chemical analysis will provide evidence that the Alps were a passage, allowing trade relationships.

LAUGEN-MELAUN CERAMICS

The Late bronze age Laugen-Melaun ceramic style is widespread in the areas of the Italian South Tyrol and Trentino, the Austrian East Tyrol, the Swiss Grisons and the Swiss-Liechtensteinian-Austrian Alpine Rhine Valley (Perini 1976, Pauli 1980, Stauffer-Isenring 1983). This style is characterised by the double conic vessel with a coarse temper and a capacity of 1 – 4 litres. They were used for storage, boiling liquids or as drinking vessels, pots etc. (Stauffer-Isenring, 1983).
Based on variations in shape and decoration, the pottery can be grouped chronologically into Laugen-Melaun A (11th century BC), Laugen-Melaun B (10-8th century BC) and Laugen-Melaun C (7-6th century BC). As the typical Laugen-Melaun ceramic is very similar among the three major regions, an attempt was made to answer the following questions by means of scientific methods:

(1) Which vessels were manufactured locally and which ones were imported? If there is any evidence of trade, what were the regions involved?

(2) How elaborate was the technology used by ancient potters? Is there any evidence of a chronological evolvement and/or difference in the production of Laugen-Melaun from group A to C?

As part of a large-scale study, a total of 454 samples from the three time horizons and 30 archaeological sites were analysed (Fig. 1). The results of this study have been published already by Maggetti et al. (1979, 1982, 1983), Marro (1978), Marro et al. (1979), Stauffer et al. (1979) and Waeber (1981). Obviously, only a minimal number of samples were analysed per site. It has therefore been impossible to reflect the entire diversity of the excavated shards or the ceramics produced during this period. As a matter of fact, it was necessary to find a compromise between time spent on research and the cultural historical questions of the project.

The samples were therefore selected specifically with regards to the aims of the study. In the following, the results have been indicated in percent. This has been done for the single purpose of allowing comparisons to be drawn more quickly and efficiently. Due to the small number of samples, however, the conclusions are not statistically sufficient.

The Italian Settlements

Geology: The geological structure of the investigated area is rather simple (Fig. 2). Between Bozen and Trento, the area to the east and west of the Etsch river is marked by the presence of volcanic and/or carbonatic (dolomite) rocks. The volcanic elements form the so-called quartz-porphyric plateau, a mighty sequence of rhyolites and basalts. In addition to these components, the valley's unconsolidated sediments contain lithic fragments of gneiss, schist and granite. These occur north of the quartz-porphyric outcrops and were transported to the investigated area via glaciers and rivers.

Central Group: These sites are located at the centre of the volcanic complex. Consequently, locally produced ceramics may be expected to contain predominantly volcanic constituents (Table 1). The study of thin sections reveals rhyolite as the main non-plastic element and thus confirms this assumption. In this case, the non-plastics are temper due to the their bi-modal distribution (see Maggetti 1994 for the criteria allowing temper identification). Besides, the amount of non-plastic elements (25-50 vol.%) is in contrast to local clays, which are fatty i.e. rich in clay minerals and poor in such constituents.

Peripheral Group: In contrast to the central group, the number of shards containing entirely volcanic temper material, is significantly lower (Table 1). This is in accordance with the marginal location of the settlements. In fact, due to the geological conditions of the area, local pottery may be expected to contain little to no volcanic elements. Consequently, the fourteen objects from the two northern most locations, situated on the crystalline basement (Fig. 2), which were tempered with volcanic rock only, were not manufactured on site. Instead, they were imported from the area of the central group.

The Swiss and Liechtensteinian Settlements

Inn Valley Group: The catchment area of the Inn river, where the three sites are located, has a geological framework consisting predominantly of gneiss, schist, amphibolite, serpentinite and dolomitic limestone. Accordingly, these types of rock may be expected to occur in local pottery as non-plastic constituents. This applies to 57% of the 88 analysed shards (Table 1). The remaining 43% contain a larger or smaller amount of volcanic rock fragments of the same petrographic composition found at the Italian sites. Even though there are several small rhyolite deposits in the catchment area of the Inn (Fig. 3), they cannot have been used as a source of raw material for ceramic production, because they have been metamorphosed by the Alpine low grade metamorphism, i.e. they show a strong schistosity and contain a sericitic to chloritic matrix. In contrast, the volcanic temper fragments of the Italian shards have no schistosity and contain either a "fresh" or clayey matrix. It can therefore be concluded that the shards from the Inn Valley with volcanic rock temper were not manufactured from local material. A highly probable explanation for the similarity between their temper and that of the Italian samples may be that the Inn Valley pieces were produced in the vicinity of the Italian central group and subsequently exported to the Inn Valley. The number of samples tempered with volcanic rocks decreases markedly over the 500 year period considered in this study (Tab.2, Fig. 4). Despite the small number of samples, this phenomenon may be interpreted as a siginificant trend, because it occurs at all three sites.

Rhine valley group: The temper is characterized by either sedimentary or metamorphic constituents, which correspond to the respective geological-petrographic environment. The ceramic from the Flums-Gräpplang site, for instance, reveals a rich, schist temper, which is consistent with the triassic "Quartenschiefer" and Permian Verrucano schists occurring locally. The specimens from Altenstadt are rich in amphibolite rock fragments. This is compatible with the Hinterland of the Ill River, which contains a lot of amphibolite.

There is only one sample with an uncommon temper combination, showing calcite fragments and rhyolite. The latter points to Italy and due to its carbonate content, it could therefore originate from the northern parts of the Italian groups.

As shown by microscopic analysis, many sites possess Laugen-Melaun ceramics with the very peculiar temper serpentinite. Such rocks occur in the Grisons, but limited to particular zones (Fig. 5). Were pots with this kind of temper produced close to the large serpentinite deposits of the Platta nappe and the Arosa zone and subsequently transported to the north? Or were they manufactured in the vicinity of the excavation site, i.e. locally, and potters specifically selected serpentinite material from the sediments and moraines of the Rhine River? Considering the hiatal structure, it is likely that serpeninite fragments were added artificially. Nevertheless, rounded edges are clearly observable and may thus indicate the use of a sand fraction, added to the clay without complex treatment. Another possible explanation is the addition of serpentinitic waste material from some other technological use. This assumption can be ruled out, however, because it would be detectable by the presence of sharp angular fragments. If the ceramic was indeed manufactured locally, two options may be considered (1) either the purposeful selection of small serpentinite grains from a sand consisting of various materials; (2) and/or the use of sand that was naturally enriched with serpentinite.

In fact, it is difficult to substantiate either hypothesis. Why would potters have chosen to invest that much time and effort, and what geological process would have lead to a selective enrichment of serpentinite grains at such great distance from the parent rock? Nungässer et al. (1992) have shown that the pebble petrographic spectrum of the Rhine river at the sites from Liechtenstein contains in fact less than 1% of serpentinite. The ultrabasites may have been selected, despite being rare in the local rock spectrum, because it can be thoroughly and effortlessly softened in fire and then quenched in water, a quality demonstrated experimentally by Nungässer et al. (1992). There may have been other relevant aspects, such as particular technological properties of the serpentinite-tempered ceramic or cultural motivations. The same specific use of ultrabasic components has further been observed in bronze-age ceramics from the Isle of Anglesey (Wales, Great Britain) (Williams and Jenkins 1976). Similarly, the ultrabasite accounts for only 1% of the local river sediments. In contrast to the excavation sites of the Grisons and Liechtenstein, located to the Eastern side of the Rhine, the number of shards tempered with serpentinite becomes negligible to the West of the river. It is therefore tempting to regard the Rhine River as a boundary, separating two different technologies. However, a concentration of ophiolitic on the Eastern side of the river may be a more likely explanation for this difference, because as a result the moraines (and the most recent river gravel derived from them) are richer in serpentinite than on the West of the Rhine.

Manufacturing Techniques

According to Stauffer-Isenring (1983), the Laugen-Melaun pottery was made using the coiling technique. The comparison between raw clays and shards shows that most of the non-plastic elements have been added artificially. The amount of temper ranges from 25-50 vol. % and thus contrasts with the significantly fattier, temper-poor clays of the excavation sites and their surroundings. Further indications are the hiatal structure, as well as the splintery, angular outlines of some of the temper elements (calcite and marble in particular). On average, the shards of the Laugen-Melaun horizons A and B from the group to the West of the Rhine, contain less temper (25-30 vol. %) than those of the remaining sites (35-40 vol. %), with exception of the Bozen Basin (29±3 vol. %).

The maximum diameter of the temper grains is similar among the three horizons (1,5-3mm on average). Chronologically, neither a coarsening nor refining of the temper components could be detected. From the consistency of the average temper content, it can be inferred (at least in regards to A and B) that manufacturing techniques did not change significantly throughout the centuries.

The temper grains are mostly rounded or have at least rounded edges. It can therefore be concluded that potters used natural sand. Controlled crushing of coarse components can only be detected for the marble/calcite temper and the addition of grog. Grog is seldom found in the Laugen-Melaun shards and never accounts for more than 1 vol. %. In the ware of other cultural orientations, however, grog appears to have been the preferred temper element (at least at some excavation sites), thus indicating a different kind of technique.

The predominance of shards tempered with serpentinite in certain areas of the Grisons county and Liechtenstein, can best be explained by assuming a purposeful temper selection.

The firing temperatures of 550-650°C, which have been deduced from the stability range of selected critical minerals using X-ray powder diffraction, lie within the range postulated by other authors. The majority of the samples were fired under reducing, and a small part under oxidizing conditions.

Synthesis

The study of 454 sherds of the Laugen-Melaun styles A-C provided surprising results:

(1) The typical Laugen-Melaun ceramic was produced, in the studied area, for about 500 years without evolving technologically.

(2) There is evidence that ceramic import took place from the Bozen basin to the Inn valley for 500 years. Contrasting, no ceramic trade could be identified for the area further to the north. The excavated Laugen-Melaun ware north of the Inn valley is of local origin and therefore proves the existence of intensive contacts with the south. This type of ceramic may have been manufactured by local people adopting a new style or potters immigrated from the south may have continued to use their traditional methods.

CAMPANA

Beginning with the second part of the 2nd century BC, it was common for wine to be transported in amphorae from Italy to what is today known as Switzerland. Along with the wine amphorae, a finest drinking crockery, so-called Campana, was exported from Italy to the north. X-ray fluorescence analyses (18 major, minor and trace elements) of 59 fragments of such black gloss ware from 11 Swiss and German (Altenburg) sites (Fig. 6) was conducted in order to determine the Italian regions of origin of these drinking vessels. In addition to these samples, ceramics with the typical black glossy coating from settlements in the Padana region: Adria (n = 7), Verona (n = 6) and Milan (n = 14), were included in the analysis. The results were presented by Kaenel and Maggetti (1986) and Maggetti et al. (1998) and will be summarized here.

Multivariate Classification

Fig. 7 reveals the existence of five groups and numerous samples that could not be classified. An attribution of the pieces to the Italian reference groups established by the laboratory of Lyon, was attempted despite the fact that neither all Campana workshops nor the chemical composition of their productions are currently known. In order to exemplify our procedure, the Swiss specimens of two groups will now be discussed. Attribution of the remaining samples and groups respectively, can be seen in Maggetti et al. (1998).

Group 2: This group pertains to a region (Po Plain) that has not yet been well investigated, i.e. the data are not well developed, because the locations of workshops remain largely unknown (Frontini et al. 1992 – 1993, Frontini et al. 1998, Oddone 1998, Olcese and Picon, 1998, Sfrecola 1988). Group 2 and the "Padana" reference group are characterized by high nickel and chromium contents (Fig. 8). This indicates the use of clays found close to ophiolitic zones, the likes of which occur frequently in the Alpine regions to the east of the Po Plain. There are other, less significant ophiolitic zones in Liguria and the Apennines (Piacenza zone) that could be the source of clay pertaining to group 2. The discrepancy in Cr between the Swiss specimens and the reference group is likely to indicate manufacture at different workshops.

Group 5: Fig. 9 shows a shift between the Swiss samples and the reference group "Campana A", as well as the existence of two marginal samples (34, 58). It is difficult to say if the shift between the two histograms is linked to the use of different calibrations by the laboratories involved (Galetti, 1994), or if it is accidental as a result of sample selection. However, the discrepancy is too weak to change the attribution of group 5 to the reference group "Campana A". This attribution is essentially based on compositional dissimilarities among the production centers currently known in Italy. Sample 58 is marginal due to its P_2O_5 concentration (1.05 wt. %) resulting from contamination during burial. Number 34 is marginal because of a high CaO content (7.33 wt. %) compared to an average of 4.12 wt. % for the rest of group 5. However, it is known that a primary high calcium concentration is characteristic for late Campana A products. Consequently, there is no compelling reason for an exclusion of samples 34 and 58 from the Campana A group.

Synthesis

Only 48 of the 59 Swiss samples could be attributed to the 5 reference groups (Fig. 10). Based on the analyses, two main exchange axes were clearly identified. Neglecting the chronological gap of more than one century among the samples, they present as follows:

(1) The Mediterranean coast and the Rhône-Rhine corridor. Authentic Campana A products were most probably transported along this route to Celtic tribes from the 2nd century BC, followed by ceramic with a black glossy coating from Latium (Campana B, "Ncamp" reference group), then from Etruria during the 1st century, and finally from Gaul (Lyon resp. "Muette" reference group) during the second half of the 1st century BC. The result suggests long trade commerce between south and north.

(2) Transalpine route. The productions in question pertain to workshops from the Po Plain. There is no doubt that traffic occurred along alpine passes, such as the Simplon and the St. Bernard. Shards of this alpine family were found in Altenburg and Geneva, away from the main distribution route (1). The analysis provides evidence of the existence of some kind of cultural "community" on either side of the Alps with very strong relations.

DISCUSSION

In transalpine trade, luxury goods, raw materials and products lacking in one region are traded between north and south. Such an exchange can take place in the form of merchandise, stolen goods, luggage carried by migrating people or as gifts related to matrimonial or political purposes. The ceramic spectrum of the Laugen-Melaun communities living north and south of the main alpine ridge, indicates the existence of stable and long lasting communities with mutual contacts. For over 500 years, pots were transported from the south to the Inn valley. In neighbouring areas to the north, however, the Laugen-Melaun style was merely adopted and then produced locally. In the first case, the pots were transported to the Inn valley as luggage by a migrating population, as trading products for the regional market or as gifts or tributes to the Inn valley. In the second case, it is likely that potters immigrated from the south or that local people adopted the new style. As a matter of fact, the alpine ridge represented a barrier in those days, which was crossed only by new style-ideas. This can best be explained by the fact that it would have been too intricate to transport the rather fragile pots over a distance of more than 100km.

In contrast, the second example illustrates, by means of a luxury good (the so called Campana), the existence of a long trade commerce between south and north via the Rhone-Rhine corridor, as well as a transalpine exchange from the south to present day Switzerland via the alpine passes. The few Campana fragments thus allow insight into the evolution of the Celtic society, influenced by an advancing Roman economy and culture. Chronologically, Roman penetration progressed during the two last centuries BC from Campania to Etruria and finally to the region of Lyon (Kaenel and Maggetti, 1986). No Campana ceramics have been uncovered at the center of the Swiss Midlands. Could this be due to a lack of findings or the isolation of the Helvetian territory before the Gallic war (58-51 BC)?

FIGURE CAPTIONS

Fig. 1 Investigated sites of the Laugen-Melaun culture. Inlet figure = typical Laugen-Melaun A vase (from Pauli 1980, p.40)

Fig. 2 Geology of the area surrounding Bozen. 1 = Quarternary, 2 = Dolomites, Limestones, 3 = Volcanic rocks, 4 = Granites, 5 = Metamorphic rocks

Fig. 3 Metarhyolite deposits (grey signature) in the south east of Switzerland (Grisons)

Fig. 4 Percental distribution of the investigated Laugen-Melaun ceramics with volcanic rock temper from the Unterengadin according to station and time horizon (Ardez n = 26, Ramosch n = 31, Schuls n = 31).

Fig. 5 Serpentinite deposits (grey signature) in the Grisonian Alps. 1 = Platta nappe, 2 = Arosa zone

Fig. 6 Investigated sites where Campana ceramics were found (N analyzed samples): Altenburg (11), Basel-Gasfabrik (3), Basel-Münsterhügel (4), Chur (3), Genève (16), Martigny (1), Ollon (1), Sion (1), St. Triphon (8), Vindonissa (8), Yverdon (3).

Fig. 7 Preliminary classification of 59, black coated ceramic samples (Campana) found in Switzerland (no symbols) and 27 samples originating from settlements in the Po Plain with indication of the main compositional groups 1 – 5. Special program developed at the Lyon's laboratory, average linkage cluster analysis, 15 chemical elements, standardised.

Fig. 8 Binary plot Ni – Cr (ppm) showing the position of the 59 analysed Swiss samples and the "Padana" reference group (shaded area).

Fig. 9 Histograms showing the Euclidian distances of the reference group of "Campana A" (from workshops of the Naples region) and of typical samples (group 5 from Fig. 7) from Swiss consumption sites. Special program developed at the Lyon's laboratory.

Fig. 10 Provenance of the Swiss Campana samples with respect to five reference groups (inlet map). The samples from Martigny and Ollon could not be attributed to an actually known reference group and are therefore not shown. The exact locations of the padana workshops forming the "Padana" reference group are unknown.

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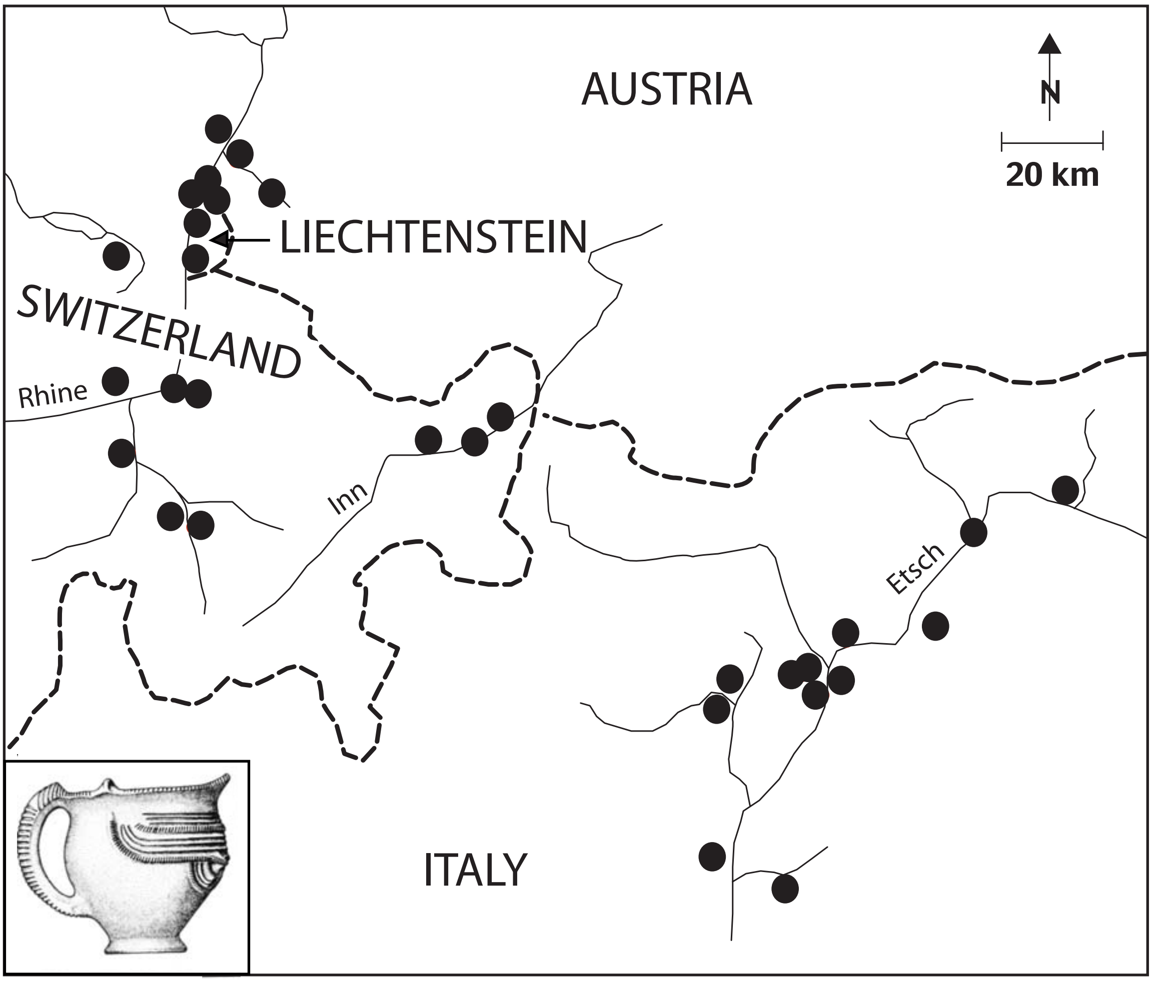
Table 1 Distribution of the fabric types (all periods)

Site	N thin sections	Fabric type (%)		
		Volcanic rocks only	Volcanic rocks and other	No volcanic rocks
Italian Central Sites	90	78	20	2
Italian Peripheral Sites	82	17	56	27
Swiss Inn Valley	88	20	23	57

Table 2 Distribution of the fabric types in the Inn valley

Locality	Period	N thin sections	Fabric type (%)		
			Volcanic rocks only	Volcanic rocks and other	No volcanic rocks
Ardez	A	7	43	14	43
	B	10	40	-	60
	C	9	11	11	78
Schuls	A	11	-	73	27
	B	8	25	-	75
	C	12	-	17	83
Ramosch	A	11	18	73	9
	B	12	42	-	58
	C	8	13	-	87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N
20 km
LIECHTENSTEIN
SWITZERLAND
Rhine
Inn
Etsch
ITALY

Fig. 1

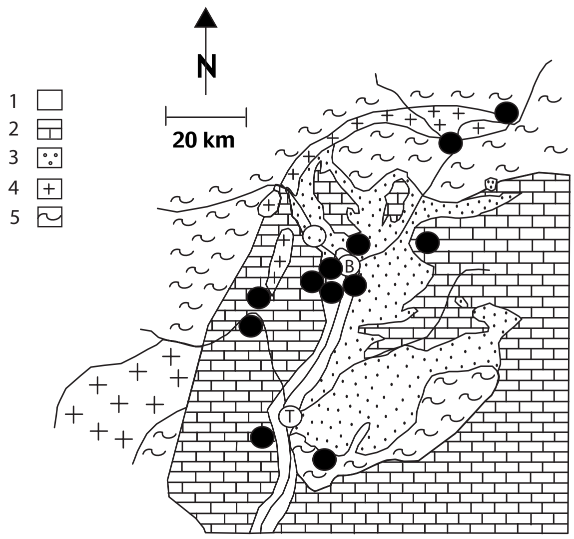


Fig. 2

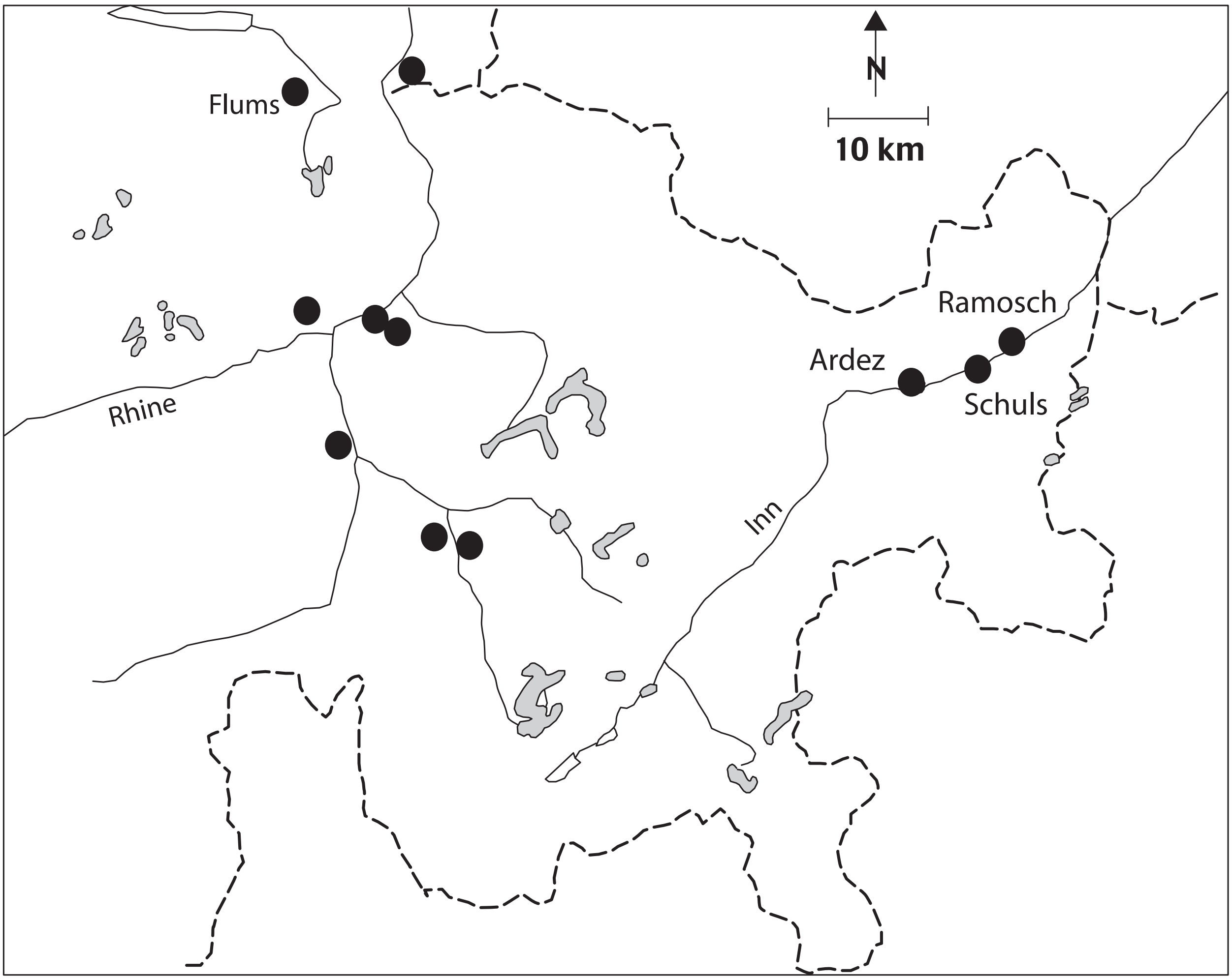


Fig. 3

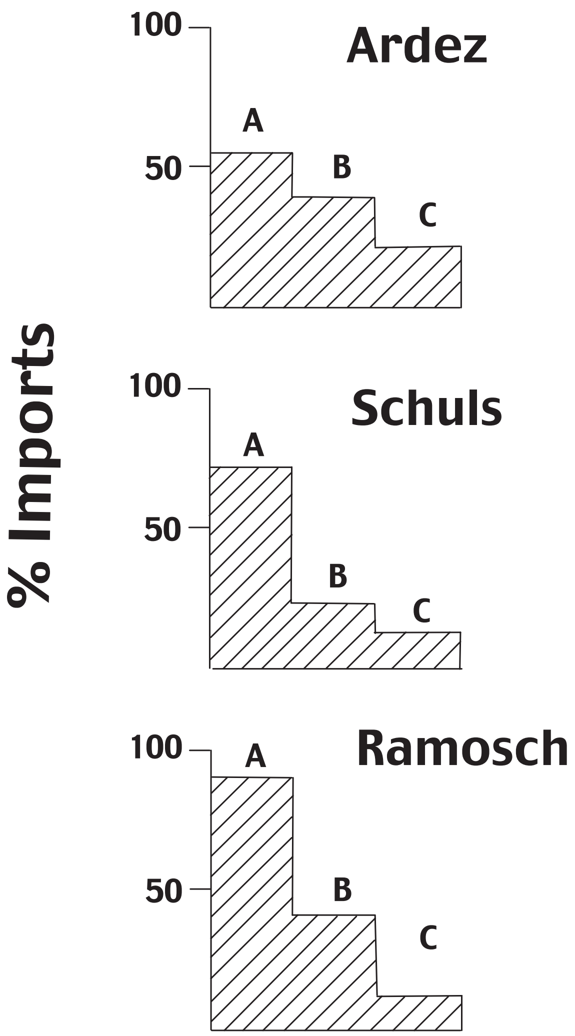


Fig. 4

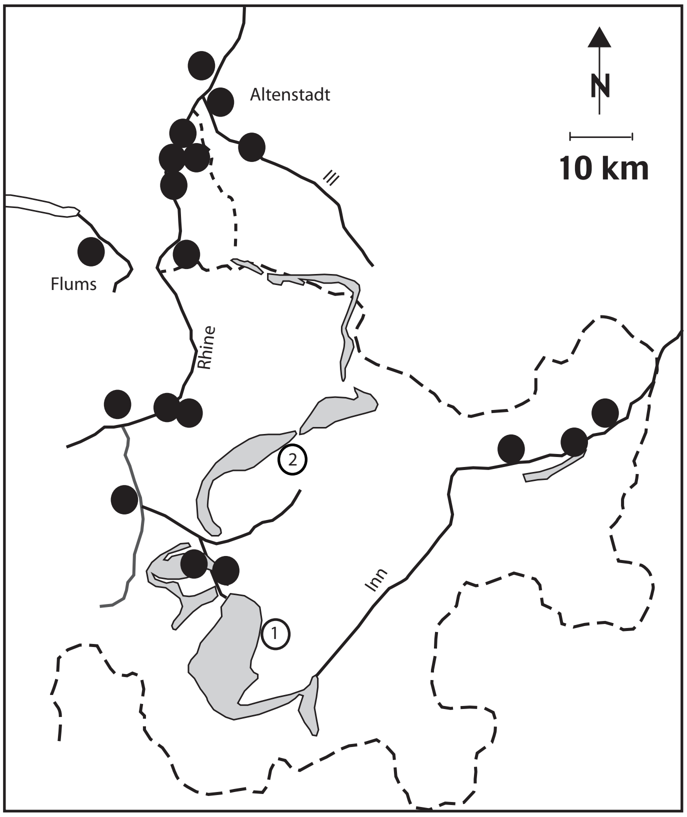
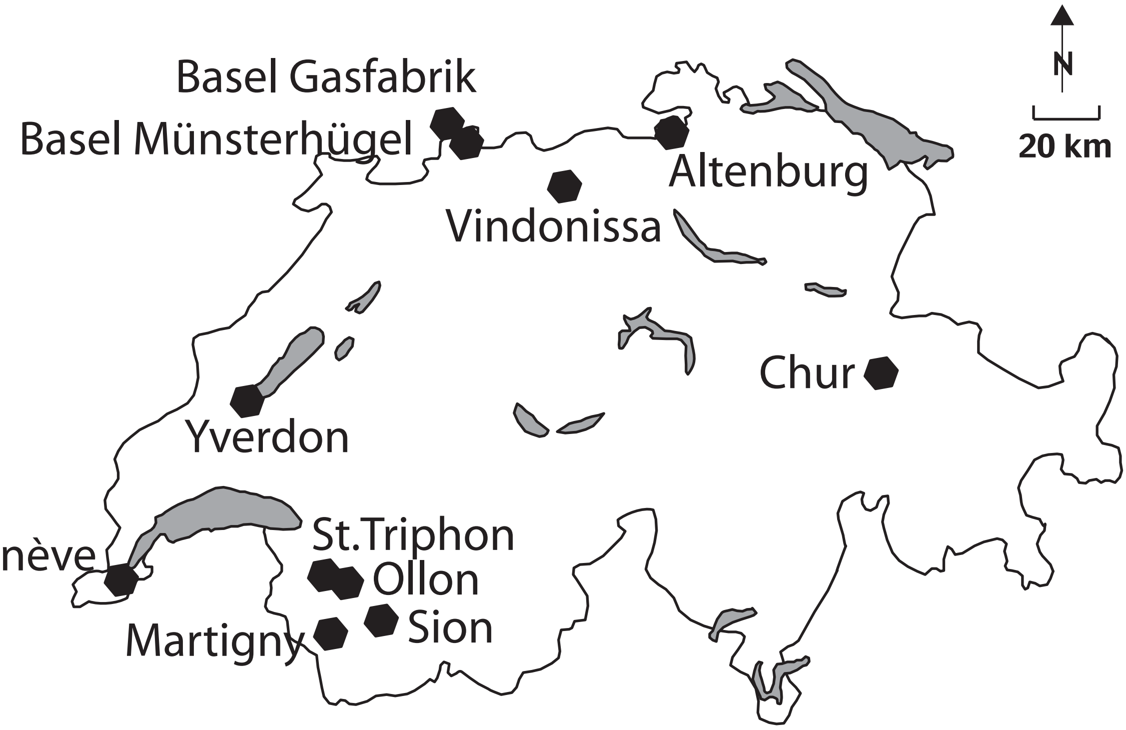


Fig. 5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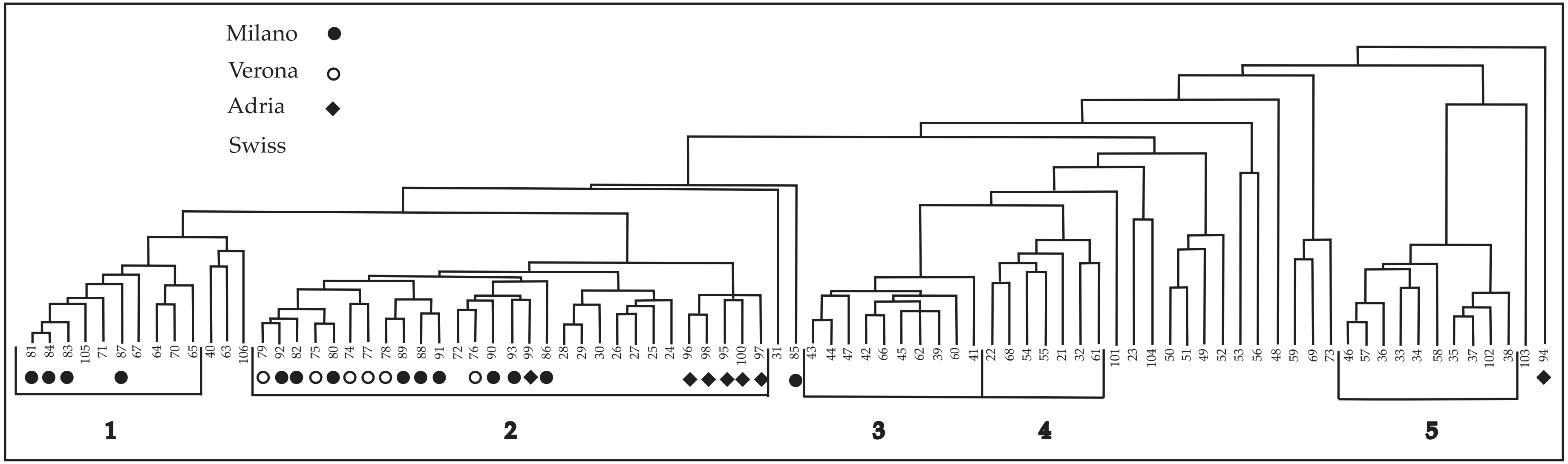
Basel Münsterhügel
Altenburg
Vindonissa
N
20 km
Chur
Yverdon
Genève
St.Triphon
Ollon
Sion
Martigny

Fig. 6


Milano
Verona
Adria
Swiss
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1
2
3
4
5

Fig. 7

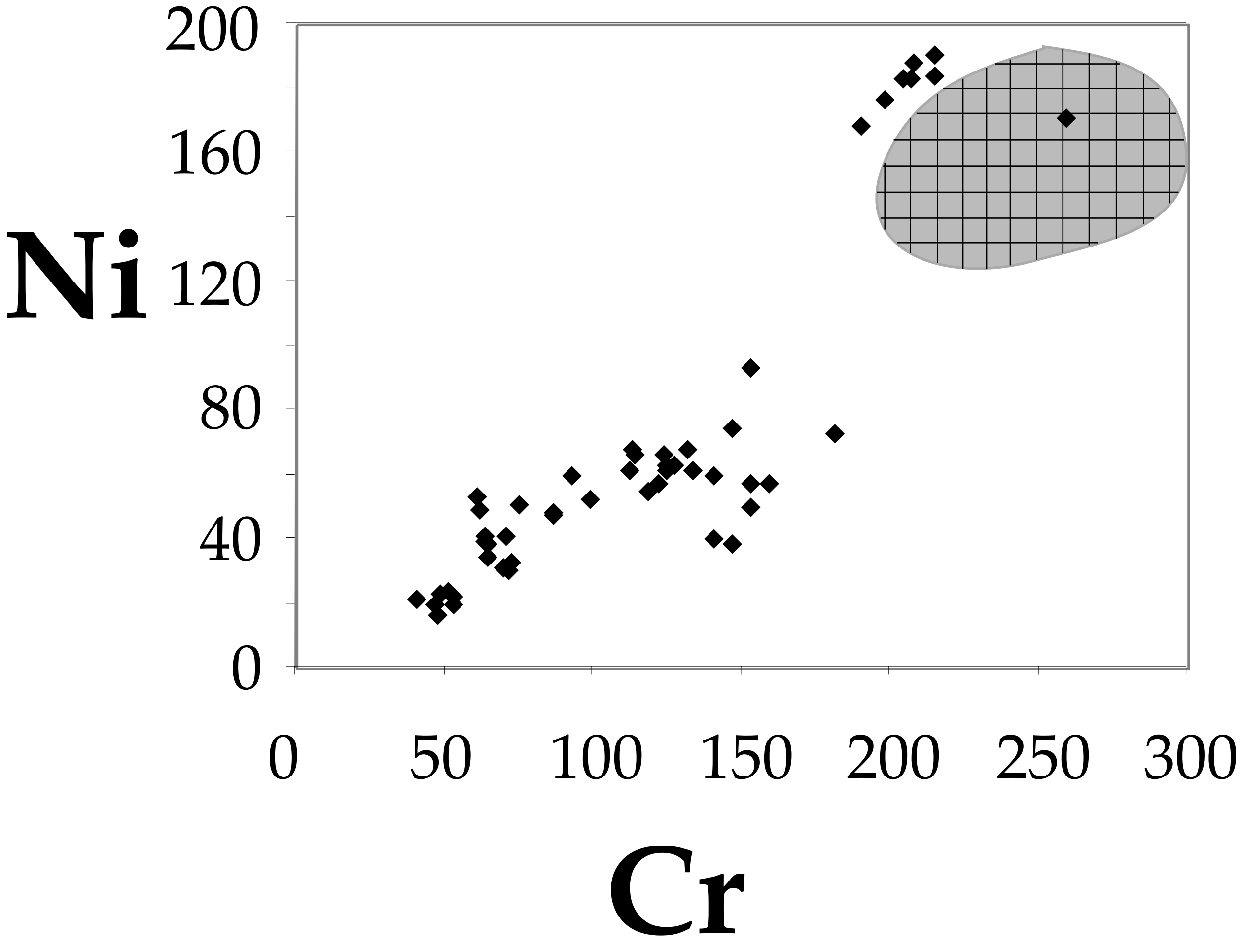
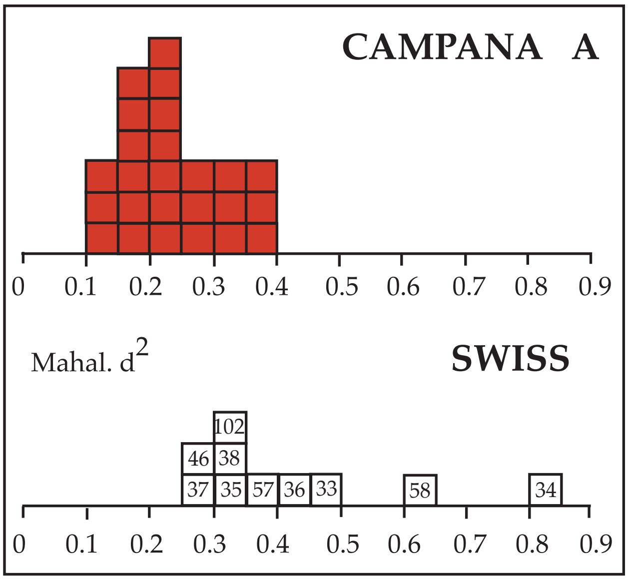


Fig. 8


CAMPANA A
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0.1
0.2
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Mahal. d2
SWISS
102
46
38
37
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57
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33
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Fig. 9

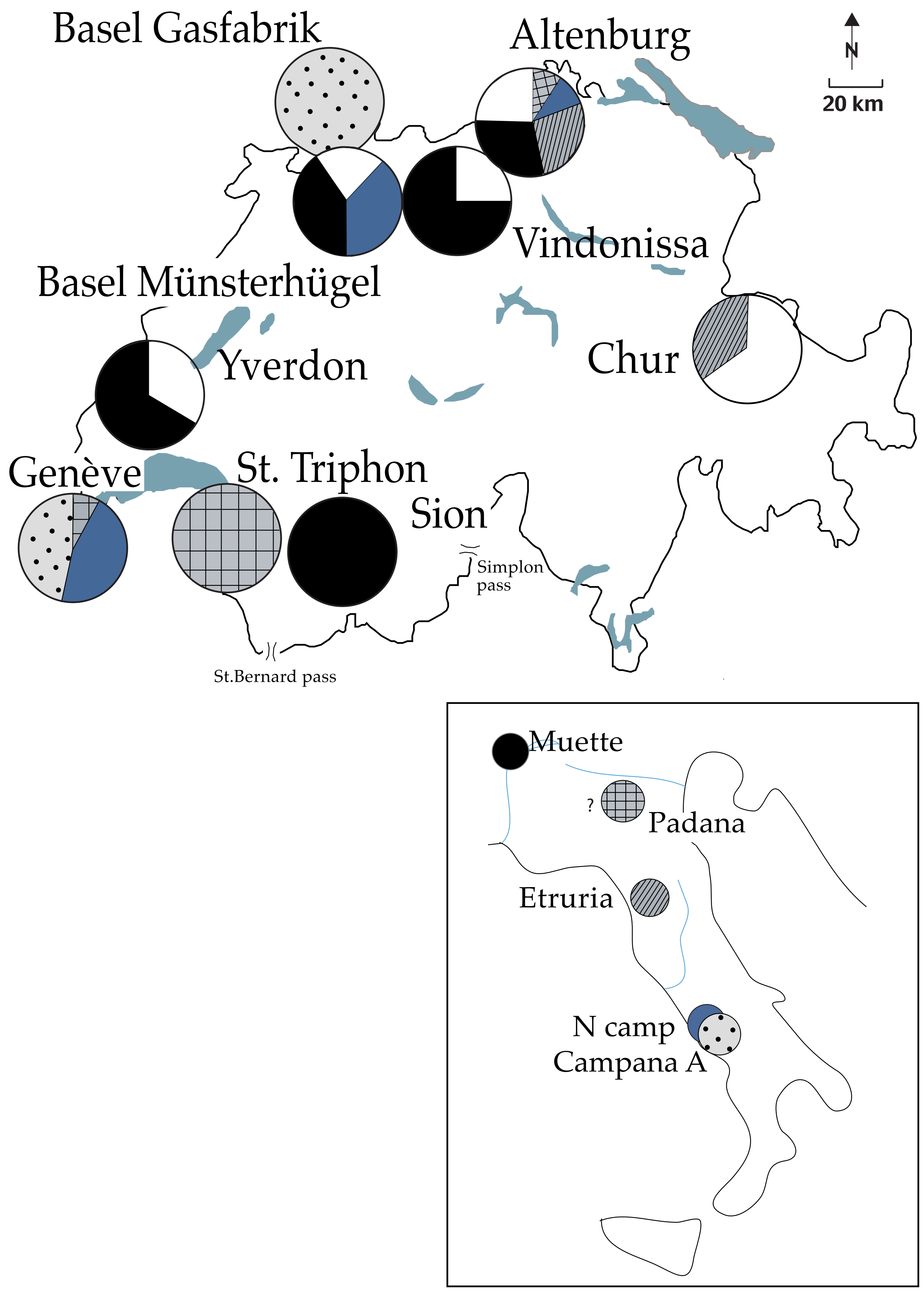
Basel Gasfabrik
Altenburg
N
20 km
Vindonissa
Basel Münsterhügel
Yverdon
Chur
Genève
St. Triphon
Sion
Simplon pass
St.Bernard pass
Muette
?
Padana
Etruria
N camp
Campana A

Fig. 10