Palaeobotany in Slovene Archaeology

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Izvleček

Predstavljene so botanične discipline, ki prispevajo k razpoznavanju paleoekonomskih in paleoekolških razmer v nekem arheo-loškem okolju in času. Podan je tudi kratek zgodovinski pregled paleobotaničnih raziskav v Sloveniji. Za primer je na kratko povzetih nekaj za arheologijo pomembnih rezultatov paleobotaničnih raziskav.

Abstract

This article presents various botanical disciplines that can contribute to the recognition of palaeoeconomic and palaeoecologic conditions within a certain archaeological environment and time. A short historical review of palaeobotanical investigations in Slovenia is also rendered. By way of example, select palaeobotanical investigations providing archaeologically significant results are concisely summarized.

INTRODUCTION

The past two decades in particular have witnessed an increasing incorporation of natural sciences, often complementing or even elucidating archaeological finds, in modern archaeological investigations. Palaeobotany plays a significant role among these "complementary" natural sciences. It involves the investigation of botanic remains, which were gathered from various archaeological sites, that were in direct or indirect connection with human activity and it extends significant palaeoecologic and palaeoeconomic information to us.

Palaeobotany has asserted itself in the field of archaeology to the point that it is also termed *archaeobotany*. A somewhat longer neologism, *palaeoethnobotany*, has the same meaning. The term *archaeopalynology* is used when investigations consist solely of pollen analyses.

Archaeology directly applies three technically and methodologically differing botanical disciplines, all of which contribute information concerning a former environment, man's influence upon the environment as well as the manner of life and subsistence of man within this very environment. The three disciplines are as follows:

a) *Carpological analyses.* This refers to the determination of the various types of seeds and fruits, in particular those that represented a part of the sustenance. Most often this comprises of charred cereal grains and their faithful companions, weed seeds. Apart from within the layers of the pile-dwelling settlements, uncharred seeds are rarely preserved. Of the fruits, only the stones of fruits, the rinds and hulls and also nuts, which sometimes survive even uncharred, are preserved.

b) *Xylotomical and anthracotomical analyses* of wood and charcoal from archaeological sites partially reveal what the surrounding forest that provided wood for burning and for building houses and for creating tools or weapons resembled.

c) *Palynological analyses* elucidate the palaeoeconomic conditions that were created by the then vegetation, forests in particular. They usually include a longer period such that changes in the vegetation in the environment during the time prior to settlement, during settlement as well as after settlement can be observed. The circumstances of the environment before it was settled by man and in what condition it was later left can be discerned. Whether a natural forest stood there or whether it was already a degraded woodland, grassland or even tillable land can be determined. Nonetheless, the reverse possibilities should not be overlooked: perhaps the characteristic disturbances in the natural vegetation, observed from the pollen

diagram, are an indication of the proximity of a yet undiscovered settlement.

A SHORT HISTORICAL REVIEW OF PALAEOBOTANICAL INVESTIGATIONS IN SLOVENIA

K. Deschmann, the then collator and director of the Regional Museum for Carniola (*Krainisches Landesmuseum Rudolfinum in Laibach*), investigated and evaluated plant macro-remains already during the second half of the previous century. He, himself, conducted the excavations of the pile-dwelling settlements at Ig that were discovered amidst the construction of the new road toward Kočevje. In addition to studying the archaeological material finds, he also studied vegetal remains: the wooden posts for the pile-dwellings as well as seeds and fruits (Deschmann 1875; 1878).

Schrieber, in 1904, investigated plant remains from the laying out of a Roman road that was discovered near Babna Gorica (Werneck 1949, 205).

W. Schmid investigated the newly discovered pile-dwelling sites at Notranje Gorice in the years 1907 and 1908. In addition to numerous archaeological finds, he also examined the oak, poplar and alder wood posts (*ANSl* 1975, 183). He also conducted the archaeological excavation at the Poštela hillfort (Zgornje Radvanje) and carried out an analysis of the wooden remains, the charcoal in particular, himself (Schmid 1915). He presumably carried out investigations of the vegetal remains from excavations in the region of Roman Emona, although any existing data abides in his own personal notes (by word of mouth: J. Šašel and A. Šercelj). During the years between the two World Wars few archaeologists (Saria, Ložar, Klemenc) devoted their selves to more cultural questions; perhaps this was partly due to the fact that there were very few opportunities to excavate. Namely, there are no reports concerning "archaeobotanical" investigations in the archaeological literature, nor does Werneck (1949) mention any. S. Brodar was the sole individual to send a sample of wooden charcoal from Potočka zijalka (Brodar 1938, 153) to the botanist, Elise Hoffmann, in Vienna, for an analysis.

Following the Second World War, a new zealousness flared among young archaeologists and excavations were commenced throughout Slovenia. In 1947 the Slovene Academy of Arts and Sciences established the Archaeological Committee, later termed the Section for Archaeology, and then again in 1972 renamed the Institute of Archaeology. J. Korošec, the founder and director of the Section for Archaeology, planned an extensive program of excavations on the Ljubljana moor in 1953. He was entirely aware of the fact that such a project generating an abundance of excavated organic materials would also demand the cooperation of natural scientists. Thus in addition to a palaeontologist joining the research team, he also invited the botanist, A. Šercelj, who further organized a palynologic laboratory and who instigated systematic palaeobotanical investigations. These investigations comprised of pollen analyses as well as analyses of wood and charcoal from the pile-dwellings. Carpological analyses were not yet foreseen as the excavated moorland soil was not yet being sieved; nonetheless, the larger and characteristic hulls of water chestnuts (*Trapa natans*) were easily discernible.

Anthracotomical and carpological analyses became more of an actuality with the commencement of extensive excavations in drier conditions in caves.

SELECT EXAMPLES OF ARCHAEOBOTANIC INVESTIGATIONS

The Ljubljana Moor

Palaeobotanical investigations of the pile-dwelling settlements on the Ljubljana moor were carried out for numerous years parallel with the archaeological excavations conducted by T. Bregant. Initially xylotomical analyses were predominate. More than a thousand posts were analyzed. It was established, among others, that oak wood was the predominate construction material at the Maharski prekop pile-dwelling settlement, while ash wood predominated at Parte, which is also an indication of chronologically varying settlement formation phases. Pollen analyses of sediments from drilling holes or cross-sections were also regularly carried out. The effect of human activity upon the surrounding vegetation is perceivable from all the pollen diagrams, even more can be said of the then agricultural activity considering that the pollen of cereals is always present in the cultural layers (Culiberg 1984; Culiberg, Šercelj 1978; 1980a; 1980b; Šercelj, Culiberg 1978; 1980). Much less was done in the line of carpological investigations during the initial excavations. Carpological analyses were at first sporadic, usually of the chance find of a seed or fruit, and then with time increasing amounts of soil from the cultural layers were examined. The finds were a success right from the start: cereal grains and

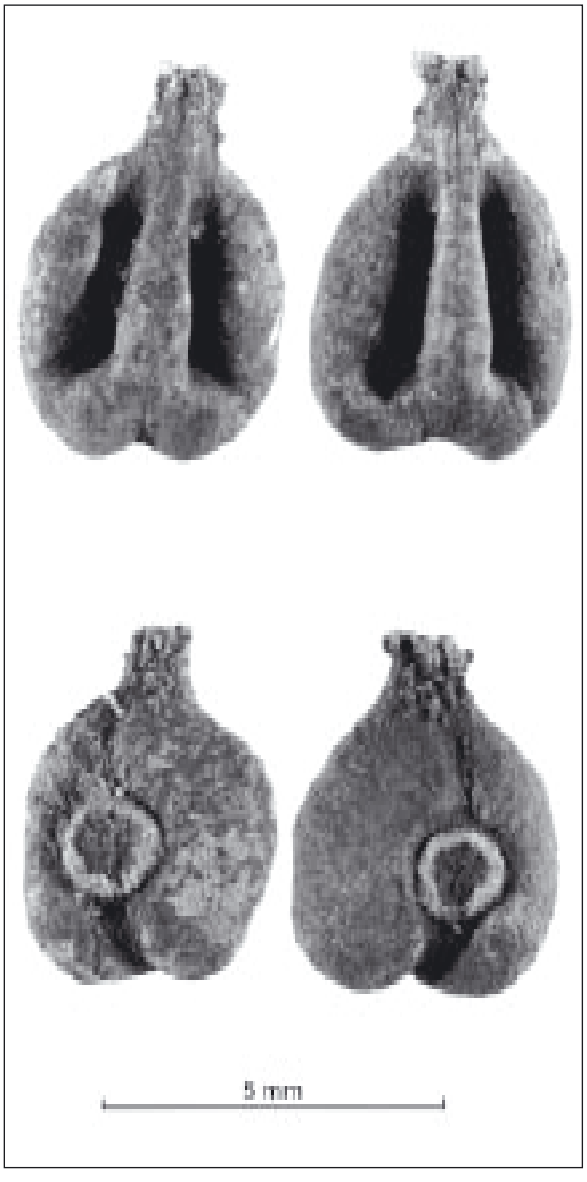

Fig. 1: Vine seeds (*Vitis vinifera* ssp. *sylvestris*) from the cultural layer from Parte pile-dwelling settlement.
Sl. 1: Peške vinske trte (*Vitis vinifera* ssp. *sylvestris*) iz kulturne plasti kolišča Parte.

the stone fruits of cornelian cherry (*Cornus mas*) and blackberry (*Rubus*). The most significant was definitely the find of vine seeds (*Vitis vinifera* ssp. *sylvestris*) found at the pile-dwelling site at Parte (*Fig. 1*). The cultural layer in which these seeds were discovered dates to 4000±100 BP (Z-540) according to radiocarbon analysis. Till then these represented the oldest traces of vine in our region. Select individuals expressed some doubt concerning the age of these seeds, however newer and more thorough palaeobotanic investigations of newer finds from the Ljubljana moor will certainly annul any further doubts.

The Dolenjska Region

Archaeological investigations of prehistoric hillfort settlements throughout the Dolenjska region have invariably yielded seeds of various cereals: wheat (*Triticum sp.*), barley (*Hordeum sp.*) and millet (*Panicum miliaceum*), as well as cereal weeds. From leguminous plants the grains of horsebeans (*Vicia faba*) and peas (*Pisum*) have been found (Culiberg, Šercelj 1995a).

A particular point of interest is the regular bearing of quite a large number of seeds crossbreed between the *Brassica* and *Sinapis* genera. These are the predecessors of today's variety of cabbage, turnip, kohlrabi and mustard. According to the present stance of our knowledge, seeds from the genus *Brassica* and dating to the period extending from the Bronze to the Iron Ages are quite a rare find. Perhaps the idea that the presumable native soil of such cultivators is precisely in our region as opposed to the Mediterranean, as suggests Hegi (1986), deserves some merit.

Kučar

Analysis of larger amounts of wooden charcoal left behind by Iron Age or Late Roman inhabitants suggests the existence of an oak forest mixed with hornbeam (*Carpinus*), hop-hornbeam (*Ostrya*), maple (*Acer*), hazel (*Corylus*), ash (*Fraxinus*) and elm (*Ulmus*). The high frequency of a type of poplar (*Populus tremula*), most likely the trembling poplar, indicates a heavily degraded pasturage landscape. The wood of fir (*Abies*), which is well represented as construction material, was most likely transported from the more distant and modest remains of a beech-fir forest.

As far as cereals are concerned, only grains of millet were discovered, and that in large amounts; a few grains were from the genus *Brassica* indicating cabbage, turnip, kohlrabi or mustard (Culiberg, Šercelj 1995b).

Gorjanci

Two pollen diagrams from Gorjanci (Culiberg, Šercelj 1997a) illustrate a strong reduction in forest land which could easily have been in consequence to the colonization of the Uskoki. Gruden (1992) claims that these peoples settled in Žumberk and Marindol during the first half of the 16th century. They would have required large pasturage area considering that they lived off of stockbreeding.

This coincides with the pollen diagrams which indicate high pollen values in grass vegetation. That agriculture was also a significant branch is depicted in the pollen diagrams by the high pollen values of cereals. Buckwheat (*Fagopyrum*) is of special significance. The Uskoki were likely to have brought it along with them from elsewhere. Its natural habitat is namely in south-eastern Asia; it was brought to Europe also somewhat earlier via the Islam world (ital.: grano sarraceno). It is mentioned in Slovenia in the Gornji grad land register from the year 1426 (Blaznik et al. 1970).

Vranje near Sevnica

The results of the anthrcotomical and xylotomical analyses indicate that oak wood was predominate. Most likely the settlement was surrounded by a mixed oak forest along with hazel, alder (*Alnus*) and even chestnut (*Castanea*). There were probably very few beech (*Fagus*). The wood of fir used as construction material and especially the wood of yew (*Taxus*) used for tools were probably brought from elsewhere.

Pollen analyses were carried out on samples of sediment from the water well, which began to accumulate only once the settlement was already abandoned, and soil from along the walls of the ruins. The analyses indicate a reviving forest. Pioneers seem to dominate: birch (Betula), hazel, alder and hornbeam. Chestnut and even beech seem to have grown as well. The presence of walnut (*Juglans*) is also of some interest.

The pollen analyses of vegetation other than trees encompass the pollen of cereals and other grasses, Compositae and mugwort (*Artemisia*). Pasturage and the cultivation of land in proximity to the settlement are indicated (Culiberg 1998).

Ajdovska jama

Archaeological excavations between the years 1982 and 1990 revealed this to be the largest cave necropolis in Slovenia; it was in use from the Late Stone Age or even the Palaeolithic all through to the late Middle Ages. The second cultural layer (radiocarbon date: 5625±130 BP), presenting individual graves, is of particular significance as it attests that the cave served as a cemetery and as a place of worship at that time.

The recovery of plant materials, wooden charcoal as well as seeds, are plentiful (Culiberg, Horvat, Šercelj 1992). Analyses of the wooden charcoal, which was partially spread out and partially still intact in the hearths, or even as a charred log of wood, indicate that the surrounding forest was already under strong anthropogenic impact. Elements indicating a climax forest (Abieti-Fagetum) are lacking; light oak-hornbeam forests dominated, with the presence of ash and linden (*Tilia*) as well as pioneer types of poplar, willow (*Salix*) and hazel.

There is quite a variety of types of alimental plants among the charred grains that were widely scattered over the cave floor (most likely for ritual purposes): the majority was barley, various types of wheat, and horsebeans and peas from the leguminous family. The seeds of vetch (*Vicia sp.*), a grain weed, are also sporadic. These finds suggest intensive settlement with pasturage and the cultivation of land.

Poštela

The taxonomic structure of tree charcoal from Iron Age graves at Poštela suggest that the surrounding forest in direct proximity to the hillfort had already undergone a good deal of change. The essential elements of the then natural Pohorje forests - fir and beech - are poorly represented in comparison with the elements of a mixed, phytocoenological indeterminate forest and the pine and poplar tree pioneers (Šercelj 1990a).

Rabeljča vas near Ptuj

Archaeological excavations of the Roman necropolis at Rabeljča vas even presented the discovery of southern fruits in two Roman graves, probably as grave goods. Dates, figs, pomegranates and jujubes (*Zizyphus jujuba*) were determined. Each of these fruits had to have been brought from the Mediterranean region (Šercelj 1990b).

Divje babe I

Palaeobotanical investigations in the Palaeolithic cave of Divje babe near Idrija are in process already since 1980 in correspondence with the archaeological excavations. The results of pollen analyses of cave sediments are for the most part moderate; numerous pieces of charcoal from various hearths were also examined (Culiberg, Šercelj 1997b).

The upper layers 4-17 to a depth of 5.5 m contained enough pollen and spores that the vegetation could

be depicted in a pollen diagram. The layers 17-26 from a depth of 5.5 m to 11 m contained enough pollen only in select layers, while other layers only contained individual grains. The predominately coniferous trees - pine (*Pinus*) and spruce (*Picea*) - are characteristic of exclusively Pleistocene vegetation. Nonetheless, pollen of deciduous trees - hornbeam, hazel, linden, hop-hornbeam and even up to a value of 5 % beech in the layers 17-17b - was also present. This is significant for climatological evaluation purposes. The families of Compositae, Umbelliferae and Dipsacacae plants, in addition to a large number of fern spores, are predominate among the pollen of herbs. This pollen, and likewise also the fern spores, could not possibly have been transported into the cave by wind but rather must have been carried in by bears or humans. The pollen of mostly entomophilous Compositae was probably obtained from the excrement of bears that nibbled away at the fresh vegetation on the plateau above the cave after their hibernation. Analogous conditions were determined also at the Vindija cave in Croatia (Draxler, 1986).

The results of the anthracotomical analyses indicate that the majority of charcoal pieces examined were of coniferous origins: pine and spruce. There were many fewer deciduous trees, of which beech, ash, and willow/poplar were determined. The discovery of the charcoal of a yew (*Taxus*) more towards the back of the cave is quite extraordinary. The wood of yew was most likely used for tools and weapons considering its hardness and pliability.

CONCLUSION

Select significant results which are the product of more extensive and long standing palaeobotanical investigations were presented in elucidation. The list of archaeological sites procuring palaeobotanical investigations is really much more comprehensive. More than one hundred sites and their corresponding analyses are registered in the index files (Šercelj, Culiberg: The Jovan Hadži Institute of Biology, Scientific Research Center SAZU). Numerous results are published independently or as supplements to archaeological publications, while many have remained only reports.

Palaeobotanical investigations, in addition to those mentioned at Divje babe, are being carried out at numerous other Palaeolithic stations: Mokriška jama, Poljšiška cerkev, Babja jama, Koprivška luknja, Ciganska jama, Matjaževe kamre, Lukenjska jama, Postojnska jama, Betalov spodmol, Parska golobina, Jama v Lozi, Ovčja jama, Županov spodmol, Zakajeni spodmol and others (Šercelj, 1996; Šercelj, Culiberg 1985). The vegetal remains at Palaeolithic stations are for the most part wood charcoal and rarely also pollen (as at Divje babe). Analyses of the determined types of trees can partly contribute to the chronological determination of a site depending upon the palaeoclimatic conditions.

The later archaeological eras introduce a larger variety of vegetal finds. Various types of seeds of cultivated plants as well as fruits and stones of fruits that were gathered in the surrounding vicinity have been determined at Neolithic sites. A large amount of charcoal and wooden material that was used for construction purposes or for tools is also present. Analyses of all these remains can provide significant insight into understanding the palaeoecologic conditions of a landscape. The Ljubljana moor pile-dwelling settlements and Ajdovska jama furnished the most in terms of vegetal finds. Analyses of large amounts of wood charcoal from the Neolithic site of Hardek near Ormož are currently running; it seems that other vegetal remains are scarce.

There is a mass influx of alimental cultivated plants, in conjunction with the *Brassica* family, during the Bronze and Iron Ages. The legumes - horsebeans, peas and flax - are also more frequent. In addition to an increase in the number of sites in the Dolenjska region and at Kučar, palaeobotanical investigations were also initiated at Dolnji Lakoš (Bronze Age) and furthermore at the Iron Age sites of Most na Soči, Molnik near Škofljica, Poštela, the SAZU courtyard etc.

The fruits of southern fruits discovered in the Roman graves at Ptuj are an indication of intensive merchandise trade and good connections during Roman times.

As mentioned already in the historical review, the appeal for palaeobotanical investigations in Slovenia surfaced soon enough, although only among select archaeologists. This interest augmented in response to the significant finds and results that were the consequence of interdisciplinary cooperation. Nonetheless, a more extensive history of intensive archaeobotanical investigations is lacking even in Europe, especially in Germany, France and Holland, where there are numerous active palaeobotanists.

It is by all means commendable that all excavated material is thoroughly examined at the majority of current archaeological excavations. Material finds are ever increasing and likewise also it seems that archaeobotany is experiencing its prime.

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Paleobotanika v slovenski arheologiji

Prevod

UVOD

V sodobne arheološke raziskave se zlasti v zadnjih dveh desetletjih vključuje vedno več naravoslovnih ved, ki mnogokrat dopolnjujejo ali celo pojasnjujejo arheološke najdbe. Pomembno mesto med temi "dopolnilnimi" vedami ima pa-leobotanika. Raziskuje rastlinske ostanke iz arheoloških naj-dišč, ki so bili v neposredni ali posredni povezavi s človekovim bivanjem in delovanjem, ter nam posreduje pomebne paleoekološke in paleoekonomske podatke.

Paleobotanika se je v arheologiji že toliko uveljavila, da so jo poimenovali kar *arheobotanika*. Isti pomen ima tudi nekoliko daljša skovanka, *paleoetnobotanika*. Kadar pa so raziskave le palinološke, govorimo o *arheopalinologiji*.

V arheologijo se neposredno vključujejo tri tehnološko in metodološko različne botanične discipline, vse pa prispevajo informacije o nekdanjem okolju, o vplivu človeka na to okolje ter o načinu življenja in prehranjevanja človeka v tem okolju. Tako razlikujemo:

a) *Karpološke raziskave*. To je določanje vrste semen in plodov, predvsem tistih, ki so bili del človekove prehrane. Največkrat so to zoglenela zrna žit in semena plevelov, njihovih spremljevalcev. Nezoglenela semena se razen v plasteh koliščarskih naselbin le redko ohranijo. Od plodov najdemo le koščice, lupine in oreške, ki pa se ohranijo tudi nezogleneli.

b) *Ksilotomske in antrakotomske raziskave* z analizo lesa in oglja iz arheoloških najdišč delno razkrijejo, kakšen je bil okoliški gozd, ki je dajal človeku les za kurjavo, za gradnjo bivališč in za izdelavo orodja ali orožja.

c) *Palinološke raziskave* pa posredujejo sliko paleoekoloških razmer, ki jih je ustvarjala vegetacija, predvsem gozd. Navadno zajemajo daljše obdobje in tako lahko spremljamo spremembe vegetacije v okolju iz časov pred naselitvijo, ob naselitvi in po njej. Vidimo kakšno je bilo okolje, ko se je človek naselil in kakšno okolje je zapustil. Izvemo, ali je bil tam še naravni ali morda že degradirani gozd, pašnik ali celo obdelovana zemlja. Ne smemo pa prezreti tudi obratne možnosti, da nas značilne motnje v naravni vegetaciji, ki jih razberemo iz pelodnega diagrama, lahko opozorijo na bližino še neodkrite naselbine.

KRATEK ZGODOVINSKI PREGLED PALEOBOTANIČNIH RAZISKAV V SLOVENIJI

Že v drugi polovici preteklega stoletja je K. Dežman, teda-nji ravnatelj Deželnega muzeja, raziskoval in ovrednotil rastlinske

makroostanke. Sam je vodil izkopavanja koliščarskih naselbin pri Igu, ki so jih odkrili ob gradnji nove ceste proti Kočevju. Po-leg arheološkega materiala je raziskoval tudi rastlinske ostanke: kole za kolišča ter semena in plodove (Deschmann 1875; 1878).

Leta 1904 je Schrieber raziskal rastlinske ostanke s trase rimske ceste, odkrite pri Babni Gorici (V: Werneck 1949, 205).

W. Schmid je v letih 1907 in 1908 raziskoval novo odkrito kolišče pri Notranjih Goricah. Poleg številnih arheoloških najdb, je pregledal tudi kole, ki so bili iz hrastovega, topolovega in jelševega lesa (ANSl 1975, 183). Vodil je tudi arheološka izkopavanja na gradišču Poštela (Zgornje Radvanje) in sam analiziral lesne ostanke, predvsem oglje (Schmid 1915). Ob izkopavanjih na območju rimske Emone naj bi bil raziskal rastlinske ostanke, vendar so podatki ostali v njegovih zapiskih (ustno J. Šašel in A. Šercelj).

V letih med obema vojnama so se maloštevilni arheologi (Saria, Ložar, Klemenc) posvečali bolj kulturološkim vprašanjem, delno najbrž tudi zato, ker ni bilo veliko možnosti za izkopavanja. V arheološki literaturi namreč ni zaslediti poročil o "arheo-botaničnih" raziskavah in tudi Werneck (1949) jih ne omenja. Le S. Brodar je poslal botaničarki Elise Hoffmann na Dunaj v analizo lesno oglje, ki ga je našel v Potočki zijalki (Brodar 1938, 153).

Po drugi svetovni vojni so mladi arheologi pokazali veliko vnemo in začela so se izkopavanja po vsej Sloveniji. Leta 1947 je bila pri Slovenski akademiji znanosti in umetnosti ustanovljena Arheološka komisija, kasneje imenovana Arheološka sekci-ja oziroma Sekcija za arheologijo, ki se je leta 1972 preimenovala v Inštitut za arheologijo

Leta 1953 je J. Korošec kot ustanovitelj in vodja Sekcije za arheologijo zastavil obsežen program izkopavanj na Ljubljanskem barju. Vseskozi se je zavedal, da so pri takem projektu z obilico izkopanega materiala organskega porekla potrebni tudi naravoslovci. Tako je poleg paleontologa k sodelovanju povabil tudi botanika A. Šerclja, ki je organiziral palinološki laboratorij in začel s sistematičnimi paleobotaničnimi raziskavami. V to so bile vključene pelodne analize ter analize lesa in oglja iz kolišč. Karpološke raziskave še niso bile na vidiku, ker izkopane barske zemlje niso izpirali, precej velike in značilne lupine vodnega oreška (*Trapa natans*) pa so bile razpoznavne brez težav.

Antrakotomske in karpološke raziskave so postale bolj aktualne šele, ko so se začela obsežnejša izkopavanja na suhih terenih in v jamah.

NEKAJ PRIMEROV ARHEOBOTANIČNIH RAZISKAV

Ljubljansko barje

Paleobotanične raziskave koliščarskih naselbin na Ljubljanskem barju so vrsto let potekale vzporedno z arheološkimi izkopavanji, ki jih je tedaj vodila T. Bregant. Sprva so prevladovale ksilotomske raziskave. Analiziranih je bilo nad tisoč kolov. Med drugim je bilo ugotovljeno, da je na kolišču ob Maharskem prekopu prevladovala hrastovina kot gradbeni les, na Partih pa jesenovina, kar verjetno kaže na časovno različne faze nastajanja naselbin.

Redno so bile narejene tudi pelodne analize sedimentov iz vrtin ali iz profilov. Iz vseh pelodnih diagramov je mogoče zaznati človekov vpliv na okolno vegetacijo, še bolj pa njegovo takratno poljedelsko dejavnost, saj je v kulturnih plasteh vedno prisoten pelod žit (Culiberg 1984; Culiberg, Šercelj 1978; 1980a; 1980b; Šercelj, Culiberg 1978; 1980).

Precej manj pa je bilo pri začetnih izkopavanjih narejenih karpoloških raziskav. Sprva so bile le posamične, bolj naključne najdbe semen in plodov, potem so se pregledovale manjše količine zemlje iz kulturnih plasti, kasneje tudi večje količine. Že tedaj so bile najdbe uspešne: od žitnih zrn, koščic drnulje (*Cornus mas*), robide (*Rubus*); najzanimivejša pa je bila vsekakor najdba pešk vinske trte na kolišču Parte (*sl. 1*). Starost kulturne plasti, v kateri so bile te peške najdene, je po radiokarbonski analizi 4000±100 BP (Z-540). To je bila do tedaj najstarejša ugotovljena prisotnost vinske trte (*Vitis vinifera* ssp. *sylvestris*) na naših tleh. O starosti pešk so sicer nekateri dvomili, prav gotovo pa bodo novejše in temeljite paleobotanične raziskave novih najdb na Ljubljanskem barju te dvome odpravile.

Dolenjska

Pri arheoloških raziskovanjih prazgodovinskih višinskih naselij na Dolenjskem, so bila vedno najdena tudi semena žit: pšenice (*Triticum* sp.), ječmena (*Hordeum* sp.) ter prosa (*Panicum miliaceum*) in žitnih plevelov, od stročnic pa zrna boba (*Vicia faba*) in graha (*Pisum*) (Culiberg, Šercelj 1995a).

Posebna zanimivost je redno pojavljanje kar precejšnjega števila semen križnic iz rodov *Brassica* in *Sinapis*. To so predniki današnjih vrst zelja, repe, kolerabe, gorčice. Po dosedaj znanih podatkih so najdbe semen rodu *Brassica* za ta čas, to je od bronaste do železne dobe, bolj redke. Zato bi bilo mogoče pomisliti tudi na to, da je domnevna domovina omenjenih kultivarjev prav tu in ne morda v Mediteranu, kot meni Hegi (1986).

Kučar

Analiza večje količine lesnega oglja, ostanek železnodobnih ali kasnoantičnih prebivalcev, kaže na mešani hrastov gozd z gabrom (*Carpinus*), črnim gabrom (*Ostrya*), javorjem (*Acer*), lesko (*Corylus*), jesenom (*Fraxinus*) in brestom (*Ulmus*). Pogostost ene izmed vrst topola, najverjetneje trepetlike (*Populus tremula*), pomeni močno degradirano, pašno pokrajino. Les jelke (*Abies*), ki je kot gradbeni material razmeroma dobro zastopan, so po vsej verjetnosti dobivali iz bolj ali manj oddaljenih skromnih ostankov bukovo-jelovega gozda.

Od žit so bila najdena le zrna prosa, in to v precejšnjih količinah, nekaj zrn pa je bilo tudi iz rodu *Brassica*, kar je lahko zelje, repa, koleraba ali ogrščica (Culiberg, Šercelj 1995b).

Gorjanci

V dveh pelodnih diagramih z Gorjancev (Culiberg, Šercelj 1997a) je vidno močno skrčenje gozdov, ki je prav lahko posledica naselitve Uskokov. Ti naj bi se po Grudnu (1992) v prvi polovici 16. stoletja naselili v Žumberku in Marindolu. Ker so se preživljali z živinorejo, so potrebovali večje pašne površine. V diagramu bi to sovpadalo z visokimi pelodnimi vrednostmi travniške vegetacije. Pomembna panoga je bila tudi poljedelstvo, ki se v diagramu prav tako odraža v visokih vred-nostih žitnega peloda. Predvsem pa je najbolj zanimiva ajda (*Fagopyrum*). To so morda prav Uskoki prinesli s seboj. Njena domovina je namreč v jugozahodni Aziji, preko islamskega sveta pa se je nekoliko prej pojavila že tudi v Evropi (ital. grano sarraceno). V Sloveniji jo v gornjegrajskem urbarju omenjajo 1426. leta (Blaznik et al. 1970).

Vranje pri Sevnici

Rezultati antrakotomskih in ksilotomskih analiz so pokazali, da prevladuje hrastov les. Torej je zelo verjetno, da je tedaj obdajal naselbino mešani hrastov gozd, v katerem so uspevali še leska, jelša (*Alnus*) in celo domači kostanj (*Castanea*). Bukve (*Fagus*) pa je bilo najbrž malo. Les jelke, uporabljen kot grad-beni material, predvsem pa les tise (*Taxus*), uporabljen za orodje, je bil verjetno prinešen od drugod.

Vzorce usedline v vodnjaku, ki se je začela nabirati šele tedaj, ko je bila naselbina opuščena, in zemlje ob zidovih ruševin, smo pelodno analizirali. Pelodna slika kaže gozd, ki se obnavlja. Prevladujejo pionirji - breza (*Betula*), leska, jelša

in gaber. Razširila pa sta se tudi domači kostanj in celo bukev. Zanimiva je prisotnost oreha (*Juglans*).

V pelodni sliki nedrevesne vegetacije je pelod žit in drugih trav, košarnic ter pelinov (*Artemisia*). To kaže na pašništvo in poljedelsko dejavnost v okolici naselbine (Culiberg 1998).

Ajdovska jama

Arheološka izkopavanja v letih od 1982 do 1990 so pokazala, da gre za največjo jamsko nekropolo v Sloveniji, ki je bila obiskovana od mlajše kamene dobe ali celo paleolitika do poznega srednjega veka. Pomemben je zlasti drugi kulturni hori-zont s posamičnimi grobovi (radiokarbonska datacija: 5625±130 BP), kar kaže na to, da je bila jama v tistem času grobišče in kultni objekt.

Najdbe rastlinskega materiala, tako lesnega oglja kot seme-nja so bogate (Culiberg, Horvat, Šercelj 1992). Analize lesnega oglja, ki je bilo delno raztreseno, delno pa še v kuriščih, tudi še kot zoglenela polena, kažejo na to, da je bil gozd že pod močnim antropogenim vplivom. Elementov klimaksnega gozda (Abieti-Fagetum) namreč ni, prevladovali pa so svetli hrastovo-gabrovi gozdovi, kjer sta bila tudi jesen in lipa (*Tilia*) ter pionirske vrste: topol, vrba (*Salix*) in leska.

Od prehrambnih rastlin je med zoglenelim zrnjem, ki je bilo na široko razsuto po jamskih tleh, verjetno v obredne name-ne, kar pestro število vrst: največ je bilo ječmena, več vrst pšenice, od stročnic pa bob in grah. Tudi seme grašice (Vicia sp.), žitnega plevela, je vmes. Te najdbe kažejo na intenzivnejšo poseli-tev s pašništvom in poljedelstvom.

Poštela

Taksonomska sestava drevesnega oglja iz železnodobnih grobov na Pošteli kaže, da je bil okoliški gozd v neposredni bližini gradišča že precej spremenjen. Bistvena elementa takratnih naravnih pohorskih gozdov - jelka in bukev - sta namreč v primerjavi z elementi mešanega, fitocenološko neopredeljenega gozda in pionirjema borom in topolom, slabo zastopana (Šercelj 1990a).

Rabelčja vas pri Ptuju

Pri arheoloških izkopavanjih rimske nekropole v Rabelčji vasi je bilo v dveh rimskih grobovih med drugim najdeno tudi južno sadje, verjetno grobni pridatek. Ugotovljeni so bili datlji, fige, granatno jabolko in čičimak (*Zizyphus jujuba*). Vsi ti sadeži so morali biti tja prineseni iz območja Mediterana (Šercelj 1990b).

Divje babe I

Paleobotanične raziskave v paleolitski jami Divje Babe pri Idriji potekajo že od leta 1980 vzporedno z arheološkimi izkopavanji. Rezultati pelodnih analiz jamskih sedimentov so v večini primerov skromnejši, preiskanih pa je bilo tudi veliko koščkov oglja iz številnih ognjišč (Culiberg, Šercelj 1997b).

Zgornje plasti 4-17, do globine 5,5 m, vsebujejo dovolj peloda in spor, da je bilo mogoče vegetacijo predstaviti v pelodnem diagramu. V plasteh 17-26, v globini od 5,5 do 11 m, je bilo več peloda le v nekaterih plasteh, sicer so bila le posamična zrna. Značilnost izključno pleistocenske vegetacije je dominacija iglavcev - bora (*Pinus*) in smreke (*Picea*). Vendar se pojav-lja tudi pelod listavcev - gabra, leske, lipe, črnega gabra in v plasteh 17-17b celo bukev z vrednostmi do 5 %. To je pomembno predvsem za klimatološko oceno.

Med zeliščnim pelodom dominirajo košarnice, kobulnice in ščetnice, poleg velikega števila praprotnih spor. Ta pelod, kot tudi spore praproti, ni mogel priti v jamo z vetrom, ampak so ga vanjo verjetno zanesli medvedi ali človek. Pelod povečini anemofilnih košarnic po vsej verjetnosti izvira iz ekskrementov medvedov, ki so po zimskem spanju obžirali sveže zelenje na planoti nad jamo. Zelo podobne razmere so bile ugotovljene tudi v jami Vindija na Hrvaškem (Draxler, 1986).

Rezultati antrakotomskih analiz so pokazali, da je večina preiskanih koščkov oglja iglavskega porekla: bor in smreka. Listavcev je mnogo manj, določili pa smo bukev, jesen, vrbo/topol. Presenetljiva je tudi najdba oglja tise, in sicer bolj v notranjosti jame. Les tise so zaradi trdosti in upogljivosti verjetno uporabljali za izdelavo orodja in orožja.

ZAKLJUČEK

Za ilustracijo je bilo predstavljenih le nekaj pomembnejših rezultatov, ki so plod obsežnejših in dolgoletnih paleobotaničnih raziskav. Sicer pa je seznam arheoloških najdišč, na katerih so bile opravljene paleobotanične raziskave, mnogo daljši. V kartoteki (Šercelj, Culiberg: Biološki inštitut Jovana Hadžija, Znanstvenoraziskovalni center SAZU) je skupno z analizami zabeleženih več kot sto nahajališč. Mnogo rezultatov je bilo objavljenih samostojno ali kot dodatek arheološkim objavam, precej pa jih je ostalo kot poročila.

Paleobotanične raziskave so poleg v že omenjenih Divjih babah potekale še v številnih drugih paleolitskih postajah: v Mokriški jami, Poljšiški cerkvi, Babji jami, Koprivški luknji, Ciganski jami, Matjaževih kamrah, Lukenjski jami, Postonjski jami, Betalovem spodmolu, Parski golobini, Jami v Lozi, Ovčji jami, Županovem spodmolu, Zakajenem spodmolu in še drugih (Šercelj1996; Šercelj, Culiberg 1985). V paleolitskih postajah so rastlinski ostanki večinoma le lesno oglje, zelo redko pa tudi pelod (kot na primer v Divjih babah). Analize ugotov-ljenih drevesnih vrst lahko delno prispevajo h kronološki opredeli-tvi najdišča glede na paleoklimatske razmere.

Mlajša arheološka obdobja prinašajo večjo pestrost rastlinskih najdb. V neolitskih najdiščih so bile ugotovljene različne vrste semen kulturnih rastlin, ki jih je človek prideloval ter plodovi in koščice sadežev, ki jih je nabiral v okolici. Veliko je tudi oglja in lesnega materiala, uporabljenega za gradnjo bivališč ali izdelavo orodja. Analize vseh teh ostankov lahko bistveno prispevajo k prepoznavanju paleoekoloških razmer pokrajine. Največ najdb je iz kolišč z Ljubljanskega barja in iz Ajdovske jame. Trenutno potekajo analize velike količine lesnega oglja iz neolitskega najdišča Hardek pri Ormožu, kaže pa, da drugih rastlinskih ostankov ni veliko.

V bronasti in železni dobi se prehrambnim kulturnim rastlinam množično pridružijo še vrste iz rodu *Brassica*. Pogostejši sta tudi stročnici bob in grah ter lan. Poleg večjega števila najdišč na Dolenjskem in na Kučarju so bile narejene paleobotanične raziskave tudi v Dolnjem Lakošu (bronasta doba) več pa še v železnodobnih najdiščih Most na Soči, Molnik pri Škofljici, Poštela, na dvorišču SAZU itd.

Plodovi južnega sadja iz rimskih grobov pri Ptuju kažejo na intenzivno izmenjavo blaga v antičnih časih ter na dobre povezave.

Kot je bilo v zgodovinskem pregledu že omenjeno, se je pokazalo zanimanje za paleobotanične raziskave v Sloveniji že dovolj zgodaj, vendar le pri maloštevilnih arheologih. Glede na zanimive najdbe in ugotovitve, ki so bile plod interdisciplinarnega sodelovanja, pa je zanimanje vse bolj naraščalo. Pa saj tudi v Evropi, zlasti Nemčiji, Franciji in Holandiji, kjer delujejo številni znani paleobotaniki, intenzivnejše arheobotanične raziskave nimajo mnogo daljše zgodovine.

Vsekakor pa je razveseljivo, da se pri večini sedanjih arheoloških del ves izkopani material temeljito pregleda. Najdbe so vse številnejše in kaže, da tudi pri nas arheobotanika doživlja svoj razcvet.

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