# Methodical problems in distinguishing the group of archaeophytes

## Metodyczne problemy przy wydzielaniu grupy archeofitów

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ABSTRACT: The paper discusses the methodical problems encountered when making up the list of archaeophytes appearing in Poland. The updated list of archaeophytes (Tab.1) including data on their appearance in archaeological excavations according to the Archaeobotanical Data Base (Lityńska-Zając – unpublished) has been attached as one of the principal parts of the paper.

KEY WORDS: alien plant species, archaeophytes, archaeobotany, diaphytes

## Introduction

Flora synanthropization process research carried out at species level has been the basis for distinguishing different groups of synanthropic taxa. Researchers of this part of the flora, especially those in Europe, have contributed to creating hundreds of terms which are not always possible to be identified because of the quality of their definitions (Sudnik-Wójcikowska, Koźniewska 1988). Principally, classification after Thellung (1915, 1918/19, 1925) has been adopted in Poland and, more widely, in Central Europe, as modified by Kornaś (1968; Kornaś, Medwecka-Kornaś 2002).

The first question to be asked is whether classifications of this type are necessary. Proper knowledge of the flora of a given territory includes not only the floristic list and species distribution maps but also a consideration of the question of their origin. It should be determined which part of the flora is indigenous and which part has appeared as a consequence of various human activities.

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In consideration of the above, the indigenous and anthropogenic parts need to be sorted out within the given flora. There are no serious problems with classifying the taxa of a given flora into these two groups. The matter becomes complicated by the presence of numerous species in synanthropic habitats, most probably native ones, whose populations in these habitats are sometimes thousands of times more numerous than those in natural habitats. This group has been distinguished as apophytes (Zając M., Zając A. 1992). However, many of them are causing problems which are discussed below.

Anthropophytes are the species which are non-native in the given flora and subject to further divisions within the classification of synanthropic species. It is possible to distinguish a group of old anthropophytes. i.e. archaeophytes and more recently arrived ones called kenophytes. The end of 15th century has been arbitrarily assumed to be the time limit for the arrival of archaeophytes on a given territory of Central Europe. This seemingly unnatural distinction has been based on one single historical fact, i.e. the discovery of America. The reason was to distinguish the American newcomers from the old synanthropic flora.

## 1. In search for anthropophytes

According to the above-mentioned analysis, an archaeophyte is an anthropophyte which came onto territory of Poland before the end of 15th century and is a permanently established species. Thus, it is necessary to answer the fundamental question of whether a given species is an anthropophyte. The question of its establishment can be omitted for the moment. Among natural or semi-natural communities we have to find those where the given taxon appears ex natura. The problem is not trivial, because currently it is difficult to indicate the natural habitat of origin for a large group of meadow and pasture species. The general range of a species can be taken into account as an auxiliary argument. There is no reasonable suggestion as to the type of habitat of origin of many species which have been defined as „meadow apophytes" (above 20 species) and which have Central Europe as their native range. They may appear in essentially natural situations which have been completely modified by human intervention, e.g. certain types of communities within valleys of large rivers. Such plants can now be called „homeless apophytes". Another source of problems is the specificity of phytosociological research where the records are taken from „typical" plots, while the plant relationships (or community structure) on small surfaces or in specific habitats are marginalized. In particular, it is hard to find any works where the description covers wherever the species appears which is of our interest (species which are dying back can be an exception).

Apart from few exceptions, xerothermic communities are regarded as seminatural ones. Most frequently, they found their place in our flora as a result of the removal of woodland communities for agricultural needs. This process extended over quite a long period of time, i.e. from Neolithic agriculture approximately 7 thousand years ago up to nearly modern times. We suppose that most species constituting those communities to have had a few original habitats in Poland, but a part of them is sure to have arrived later. The question is about the role of humans in their arrival. This problem has not been solved so far and perhaps future research works, especially molecular ones, will cast a new light on this issue.

Today we can observe how fast new anthropophytes, i.e. kenophytes, are penetrating into natural and semi-natural habitats. This process became especially intensive in the 19th and 20th centuries, i.e. when botanists were observing flora transformations in a scrupulous way. That is how we know, for example, that *Impatiens parviflora* which is established in woodlands, arrived from the forests of Central Asia. It is possible that some species were established in natural and semi-natural communities as anthropophytes a long time ago but we have no data in this respect. It is a serious possibility which should be taken into account when preparing lists of anthropophytes.

In the latest list of the vascular flora of Poland (Mirek et al. 2002) above forty species could be found whose origin have not been clearly determined. There were doubts whether the species is native or is an anthropophyte. Some of them can already be found in lists of anthropophytes (most frequently in those of archaeophytes); the status of kenophyte is probable for several of them, but the status of doubt in respect of many of them will most probably remain permanent. It is the case especially for those species whose native ranges are very close to the borders of Poland, where the doubts regarding their status must remain.

## 2. Preparing the list of archaeophytes

If we have already decided that a given species is an anthropophyte, there remains the problem to determine the time of their arrival to Poland. Archaeobotanical research is the best source in this case. Then we have plant material to classify, so the classification is based on fact. Archaeological excavations carried out using modern methods give us a high grade of certainty that the diaspore found in a given layer originates from the period as classified by archeologists. Certainly, reservations are also possible in this case. Small animals, e.g. gnawers may displace the diaspore to other layers. Therefore the finds in closed spaces, eg. in containers, are more reliable than those in the

soil. That is why several repeated confirmations of appearance within archeological excavations give more certainty. Definitions are also a problem. The archaeobotanist usually has seeds or fruits at his disposal. In case of difficult systematic groups it is sometimes necessary to verify the material. There exists an Archaobotanical Data Base in Poland which has been prepared and is updated by Maria Lityńska-Zając of the Institute of Archeology of Polish Academy of Sciences in Cracow.

Archaeological excavations in Poland's neighboring regions are another source of data. They can constitute an additional factor indicating that a given taxon belongs to the group of archaeophytes.

Another source can be the data obtained from historical materials, i.e. medieval manuscripts or summary works discussing such data. Many years ago a work appeared which confirmed the presence of several species of archaeophytes in Poland and was based on Polish medieval literature (Piekiełko, Zając 1977).

## 3. Up-to-date list of archaeophytes

The history of distinguishing archaeophytes in Poland is as follows. In 1975 a provisional list of archaeophytes was presented covering 165 species (Zając E. U., Zając A. 1975). Since then, 23 species have been excluded from this list because most of them have been classified as apophytes. 66 species from the first list had archaeobotanical documentation. 156 species could be found in works on the origin of archaeophytes appearing in Poland published in the following years by Zając (1979, 1983, 1987a,b, 1988). The present list shown herein as Table 1 presents an up-to-date list of archaeophytes. As in the case of all lists of this type, its being up-to-date depends on the progress of our knowledge of the origin of Polish flora. Slight differences in the number of items in the two latest versions of the lists are evidence of changes between the dates of their publication. Some species have been removed while others have been entered into the list.

Archaeological documentation has increased significantly. Today we have data for 112 taxa from archaeological excavations in Poland (Lityńska-Zając – Archaeobotanical Data Base). Sources from neighboring countries have been used for four species and one taxon was confirmed by the sources written before the end of 15th century. In total, 117 taxa have been documented which constitutes approx. 75 per cent of the latest list.

When viewing the lists of archaeophytes which have not been confirmed by archaeological excavations in the territory of Poland so far, several groups may be mentioned. For example, many taxa of weeds are missing which are associated with soil containing more calcium carbonate (13 species) such as

Table 1. List of archaeophytes finding in Poland with information about their occurrence in archaeological excavations

*Adonis aestivalis* L., *A. flammea* Jacq., ***Aethusa cynapium*** L., subsp. *agrestis* (Wallr.) Dostál, ***Agrostemma githago*** L., *Ajuga chamaepitys* (L.) Schreb., *Allium rotundum* L., *Alopecurus myosuroides* Huds., ***Anagallis arvensis*** L., *A. foemina* Mill., ***Anchusa arvensis*** (L.) M. Bieb., ***A. officinalis*** L., ***Anthemis arvensis*** L., ***A. cotula*** L., *Anthriscus caucalis* M. Bieb., *A. cerefolium* (L.) Hoffm., ***Apera spica-venti*** (L.) P. Beauv., ***Aphanes arvensis*** L., *A. inexspectata* W. Lippert, *Armoracia rusticana* P. Gaertn., B. Mey. & Scherb., *Artemisia absinthium* L., *Asperugo procumbens* L., ***Atriplex nitens*** Schkuhr, *A. rosea* L., ***Avena fatua*** L., ***A. strigosa*** Schreb., *A. ×vilis* Wallr., ***Ballota nigra*** L., ***Bromus arvensis*** L., ***B. secalinus*** L., ***B. sterilis*** L., ***B. Tectorum*** L., ***Bupleurum rotundifolium*** L., ***Camelina alyssum*** (Mill.) Thell., ***C. microcarpa*** Andrz., subsp. ***sylvestris*** (Wallr.) Hiitonen, ***C. sativa*** (L.) Crantz, ***Capsella bursa-pastoris*** (L.) Medik., ***Carduus acanthoides*** L., ***C. nutans*** L., ***Caucalis platycarpos*** L., ***Centaurea cyanus*** L., ***Chamomilla recutita*** (L.) Rauschert, *Chenopodium bonus-henricus* L., ***Ch. ficifolium*** Sm., ***Ch. hybridum*** L., ***Ch. murale*** L., ***Ch. opulifolium*** Schrad. ex W. D. J. Koch & Ziz, ***Ch. urbicum*** L., ***Ch. vulvaria*** L., *Chrysanthemum segetum* L., ***Cichorium intybus*** L., *Conium maculatum* L., ***Conringia orientalis*** (L.) Dumort., ***Consolida regalis*** Gray, *Coronopus squamatus* (Forssk.) Asch., ***Cuscuta epilinum*** Weihe ex Boenn., ***Descurainia sophia*** (L.) Webb ex Prantl, ***Digitaria ischaemum*** (Schreb.) H. L. Mühl., ***D. sanguinalis*** (L.) Scop., ***Echinochloa crus-galli*** (L.) P. Beauv., *Euphorbia exigua* L., *E. falcata* L., ***E. helioscopia*** L., *E. peplus* L., ***Fallopia convolvulus*** (L.) Á. Löve, ***Fumaria officinalis*** L., *F. rostellata* Knaf, *F. schleicheri* Soy.-Will., *F. vaillantii* Loisel., *Gagea arvensis* (Pers.) Dumort., ***Galium spurium*** L., ***G. tricornutum*** Dandy, ***Geranium dissectum*** L., *G. molle* L., *G. pusillum* Burm. f. ex L., ***Herniaria hirsuta*** L., *Hordeum murinum* L., ***Hyoscyamus niger*** L., ***Kickxia elatine*** (L.) Dumort., *K. spuria* (L.) Dumort., ***Lactuca serriola*** L., ***Lamium album*** L., ***L. amplexicaule*** L., *L. incisum* Willd., *L. moluccellifolium* Fr., ***L. purpureum*** L., ***Lathyrus tuberosus*** L., ***Leonurus cardiaca*** L., ***Lepidium campestre*** (L.) R. Br., ***L. ruderale*** L., *Linaria arvensis* (L.) Desf., ***Lithospermum arvense*** L., ***Lolium remotum*** Schrank, ***L. temulentum*** L., ***Malva alcea*** L., ***M. crispa*** L., ***M. neglecta*** Wallr., ***M. pusilla*** Sm., ***M. sylvestris*** L., ***Matricaria maritima*** L. subsp. ***inodora*** (L.) Dostál, ***Melandrium album*** (Mill.) Garcke, ***M. noctiflorum*** (L.) Fr., *Misopates orontium* (L.) Raf., ***Myosotis arvensis*** (L.) Hill, ***Nepeta cataria*** L., ***Neslia paniculata*** (L.) Desv., *Nigella arvensis* L., ***Odontites verna*** (Bellardi) Dumort., ***Onopordum acanthium*** L., ***Papaver argemone*** L., ***P. dubium*** L., ***P. rhoeas*** L., *Parietaria officinalis* L., ***Pastinaca sativa*** L. s. str., ***Pisum sativum*** L., subsp. ***arvense*** (L.) Asch. & Graebn., ***Ranunculus arvensis*** L., ***Raphanus raphanistrum*** L., ***Rhinanthus alectorolophus*** (Scop.) Pollich, subsp. *buccalis* (Wallr.) Schinz & Thell., ***Rh. serotinus*** (Schönh.) Oborný, subsp. *apterus* (Fr.) Hyl., *Scandix pecten-veneris* L., ***Scleranthus annuus*** L., *Sclerochloa dura* (L.) P. Beauv., ***Senecio vulgaris*** L., ***Setaria pumila*** (Poir.) Roem. & Schult., ***S. verticillata*** (L.) P. Beauv., ***S. viridis*** (L.) P. Beauv., ***Sherardia arvensis*** L., ***Silene gallica*** L., ***Sinapis arvensis*** L., ***Sisymbrium officinale*** (L.) Scop., *Solanum alatum* Moench, *S. luteum* Mill., ***S. nigrum*** L., emend. Mill., ***Sonchus asper*** (L.) Hill, ***S. oleraceus*** L., ***Spergula arvensis*** L., subsp. ***arvensis***, ***S. arvensis*** subsp. ***maxima*** (Weihe) O. Schwarz, ***Stachys annua*** (L.) L., ***S. arvensis*** (L.) L., ***Thlaspi arvense*** L., *Thymelaea passerina* (L.) Coss. & Germ., ***Urtica urens*** L., *Vaccaria hispanica* (Mill.) Rauschert, ***Valerianella dentata*** (L.) Pollich, ***V. locusta*** Laterr. emend. Betcke, *V. mixta* Dufr., *V. rimosa* Bastard, ***Verbena officinalis*** L., ***Veronica agrestis*** L., ***V. arvensis*** L., *V. opaca* Fr., ***V. polita*** Fr., *V. triphyllos* L., ***Vicia angustifolia*** L. var. *segetalis* (Thuill.) Serr., ***V. hirsuta*** (L.) Gray, ***V. sativa*** L., ***V. tetrasperma*** (L.) Schreb., ***V. villosa*** Roth, ***Viola arvensis*** Murray

Explanations: bold face – occurrence in archaeological excavations in Poland, underline – archaeophyte occurrence in miedieval literature from Poland and from neighboring countries

*Adonis flammea, Allium rotundum, Ajuga chamaepitys, Euphorbia exigua, Scandix pecten-veneris, Thymelaea passerina, Vaccaria pyramidata* and others. Most of them are barachores and speirochores which should be present as seed material. They are rare now and limited to a small region in the territory of Poland. Historically their habitats are also limited in respect of range. The exception is *Vaccaria pyramidata*, which used to be more widespread, although it was probably never frequent. At the same time another 22 species from this group can be found in the archaeological records, i.e. *Adonis aestivalis, Bupleurum rotundifolium, Camelina* (3 species), *Caucalis platycarpos, Conringia orientalis, Galium tricornutum, Nigella arvensis* and others. Hopefully, further finds of archaeobotanical materials will broaden the list of documented species. Certain ruderal habitat taxa are also missing from the archaeological records, such as, for example, *Anthriscus caucalis, Artemisia absinthium, Atriplex rosea, Chenopodium bonus-henricus, Parietaria officinalis* and others. Their absence is difficult to be explained by anything else than chance. There is another reason why species such as *Aphanes inexpsectata, Lamium incisum, L. moluccellifolium, Solanum alatum, S. luteum* are missing from archaeobotanical reports. They are taxa which are very difficult to define so there is little chance of defining them from archaeological materials.

## 4. The problems of diaphytes

Diaphytes are distinguished in numerous classifications of synanthropic plants, which are subsequently divided into ephemerophytes, i.e. not permanently established plants of foreign origin which have been brought accidentally, and ergasiophygophytes. i.e. the plants covered by cultivation which can be found as grown wild in synanthropic habitats. This is the situation for the time being. There also appear to be many cultivated plants in archaeological excavations which is a simple problem as far as cereals are concerned but does sometimes present problems, e.g. with apple trees. Presently, domesticated apple trees are classified as *Malus domestica* species, while crab apple, a natural component of our deciduous forests, is classified as *Malus sylvestris*. At present *M. domestica* is becoming naturalized not only in synanthropic habitats but also in natural communities. Nowadays such a species is regarded as a kenophyte. Certainly it is rather an absurd to transfer the present situation back to the period of thousands of years ago. We do not know if the phenomenon of *M. domestica* migration into ruderal habitats and, particularly, into natural communities occurred in the past. According to modern data it can be supposed

that the situation is rather new and modern. There are similar concerns with other species cultivated by man which are now considered to be kenophytes.

Our classifications which allow us somehow to set the evidence provided by nature in order, to classify similar phenomena and to synthesize, are rather defective ex natura. We should always bear that in mind. We should point out that our classification is based on the criteria which we are able to accept at the present time and not broaden the categories of unnecessary beings if there is no definite data.

## 5. Conclusions

The methodical problems presented above regarding the classification of archeophytes cannot be solved easily. On one hand, it is necessary to broaden our knowledge at the edaphic and phytocenotic scale, but on the other hand we also should take into consideration the development of archeobotanical research at an appropriate level. Some maps of historical location of some archaeophytes are already known in the literature from Poland (Lityńska-Zając 2005). The issue of the time-scale for the appearance of particular archaeophyte species on Polish territory requires to be solved. However, the issue of linking them to particular archaeological cultures is a question to be solved in a longer time horizon.

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