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## **Vegetation of the Dolina Kamienicy valley and the "Łabowiec" forest reserve (S. Poland)**

Jerzy STASZKIEWICZ

### **1. INTRODUCTION**

The Dolina Kamienicy valley is located in the NE part of the Beskid Sadecki Mts. (Jaworzyna Krynicka Range) and W part of the Beskid Niski Mts. The lower part of the valley lies within the submontane zone at c. (400-)450 m a.s.l. and the upper part within the montane zone (the highest hill 1082 m a.s.l.). It has a typical montane climate and vegetation season from the beginning of April to the end of October. Primarily, the whole area was afforested. Exploitation of forests which began here in the 13th century markedly changed the landscape of the valley, and at present, cultivated fields, meadows and pastures are of great importance.

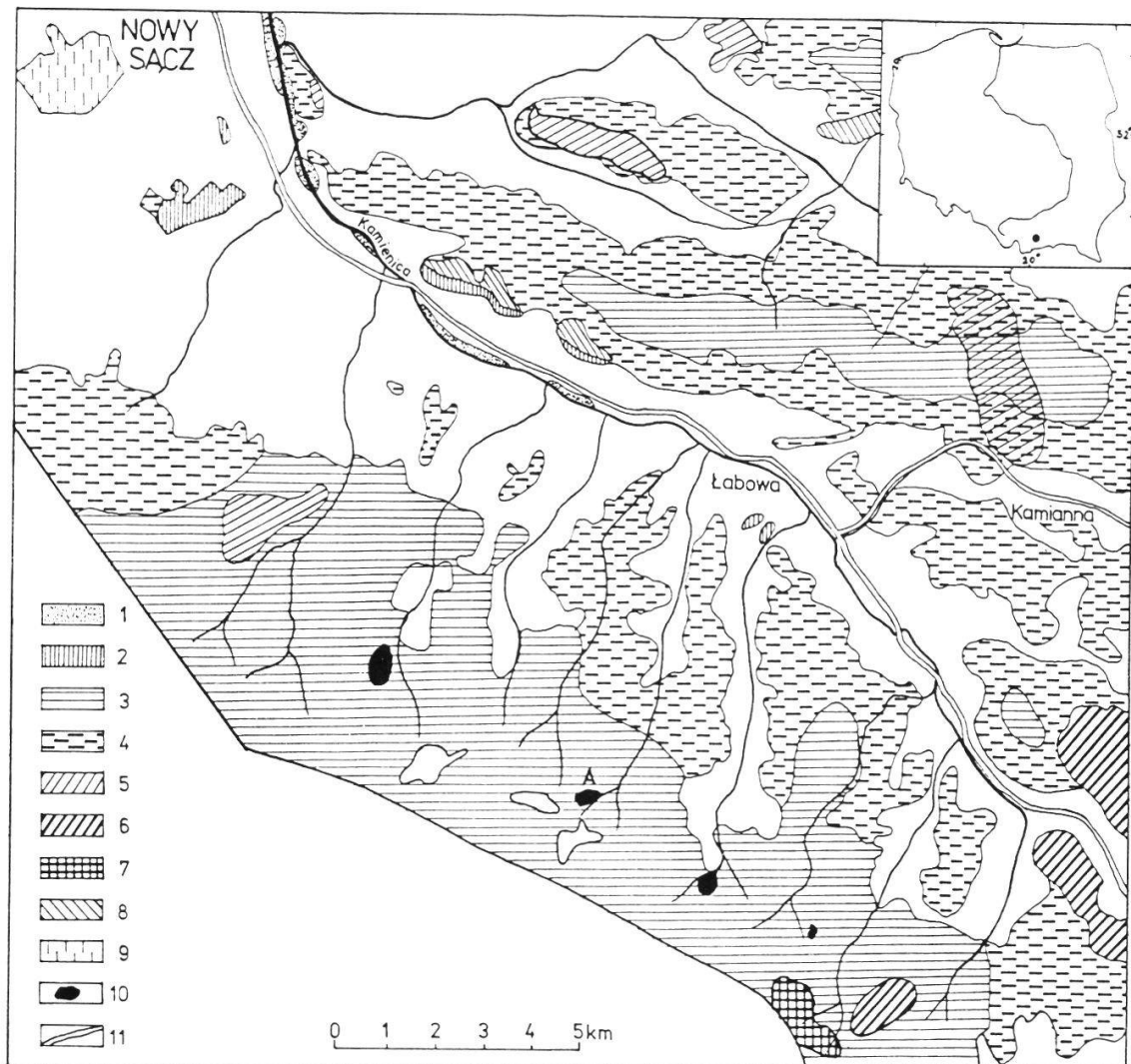
The territory on the left bank of the Kamienica river constitutes part of the Poprad river Landscape Park, established in 1987 for the protection of this part of the Carpathians. Its area is 76'000 ha, including protective zone. Four forest reserves have been established in this part of the Dolina Kamienicy valley in the lower montane zone on N slopes of the Jaworzyna Krynicka Range (Fig. 1).

### **2. PLANT COMMUNITIES**

The Carpathian beech woods (*Dentario glandulosae-Fagetum*) and fir forests of the *Fagetalia* class still remain the most important plant communities in the Dolina Kamienicy valley. The former occupy mainly higher parts in the lower montane zone of the valley and the latter develop in its lower parts. The

fir forests are differentiated in sub-neutrophilous types (of the *Fagetalia* order) and more oligotrophic and acidophilous types (of the *Vaccinio-Piceetalia* order).

Carpathian beech woods, *Dentario glandulosae-Fagetum* (*Eu-Fagion* alliance), develop on brown, leached and moist soils. The tree stand always consists of *Fagus sylvatica* and only in some areas *Acer pseudoplatanus*



**Fig. 1.** Distribution of forest communities in the Kamienica valley. (STASZKIEWICZ 1981).  
 1 - osier thickets and Carpathian alder wood *Alnetum incanae*, 2 - oak-hornbeam forest (*Tilio-Carpinetum*), 3 - Carpathian beech wood (*Dentario glandulosae-Fagetum*), 4 - sub-neutrophilous fir forest of the *Fagetalia* order (*Dryopterido dilatatae-Abietetum*), 5 - acidophilous fir-spruce forests (*Galio rotundifolii-Abietetum*, *Abietetum polonicum*), 6 - acidophilous fir-spruce forest (*Abieti-Piceetum montanum*), 7 - spruce forest (*Piceetum tatricum*), 8 - acidophilous beech wood (*Luzulo nemorosae-Fagetum*), 9 - acidophilous oak-pine forest (*Pino-Quercetum*), 10 - nature reserves, 11 - roads.  
 A - the "Labowiec" nature reserve.

dominates. *Abies alba* appears as a constant admixture. The herb layer does not show marked difference to other parts of the Carpathians.

*Lunario-Aceretum* (*Acerion pseudoplatani* alliance) develops at higher altitudes, near ridges and on slopes on extremely stony soils. Besides *Acer pseudoplatanus*, *Fraxinus excelsior* or *Fagus sylvatica* play a significant role in the area. In the herb layer, *Lunaria rediviva* dominates and *Mercurialis perennis* and *Dentaria glandulosa* occur frequently. Other species of the *Fagetalia* order are usually stifled by *Lunaria rediviva*.

The greater part of the valley is covered by fir forests of the *Fagetalia* order. Some of them have very poor undergrowth of *Rubus hirtus* shrubs, which indicates that these forests have been cleared. In many places, however, the very fertile fir forest association, *Dryopterido dilatatae-Abietetum*, of the *Galio-Abietion* alliance, develops at 350-650 m a.s.l. The tree stands are formed mainly by *Abies alba*, with admixture of *Quercus robur*, *Pinus sylvestris* and others. Shrubs are relatively rare, only *Rubus hirtus* prevails. Growing quite abundantly in the herb layer are: *Galeobdolon luteum*, *Asperula odorata*, *Galium rotundifolium*, *Senecio nemorensis*, and *Senecio fuchsii*, *Majanthemum bifolium*, *Oxalis acetosella*. The presence of *Luzula pilosa* and *Vaccinium myrtillus* is also highly significant. The community is most similar to the *Dentario glandulosae-Fagetum* association, however, there are no characteristic species of this association. It also differs from a *Dentario glandulosae-Fagetum* by its soil condition, since it usually grows on acid brown soils.

The fir-spruce forests, *Galio rotundifolii-Abietum* and *Abieti-Piceetum montanum* (of the *Vaccinio-Piceetalia* order), occupy mainly the NW part of the area within the lower montane zone (SWIES 1982). In the *Galio rotundifolii-Abietetum* association, *Dentaria glandulosa*, *Mulgedium alpinum*, *Doronicum austriacum* and *Vaccinium myrtillus* grow in the herb layer. In the very acidophilous association, *Abieti-Piceetum montanum*, the herb layer is composed of *Vaccinium myrtillus*, *Homogyne alpina*, *Oxalis acetosella*, *Rubus hirtus*, *Rhytidadelphus squarrosus*, *Dicranum scoparium*, *Polytrichum juniperinum* and *Polytrichum commune* (SWIES 1982).

The high mountain spruce forest, *Piceetum tatricum* (of the *Vaccinio-Piceetalia* order), is found only near Runek summit above 1050 m a.s.l. (LESINSKI and ROZANSKI 1986). The herb layer is composed of *Vaccinium myrtillus*, *Luzula silvatica*, *Athyrium alpestre*, *Homogyne alpina* and *Blechnum spicant*.

The *Abietetum polonicum* community (of the *Vaccinio-Piceion* alliance) develops on the small areas of the flat ridge or gentle slopes. *Abies alba* domi-

nates in the tree layer. In the herb layer, *Vaccinium myrtillus*, *Dryopteris austriaca*, *Blechnum spicant*, *Majanthemum bifolium*, *Luzula pilosa* and others frequently occur. The moss layer is composed mainly of *Sphagnum girgensohnii*, *Polytrichum attenuatum*, *Leucobrium glaucum*, *Dicranum scoparium* and *Pleurozium schreberi*. The community develops on podzolic soils, sandy and stony clays, or even cryptozolic soils.

In the submontane zone [300-450(500) m a.s.l.], small oak-hornbeam woods of the *Tilio-Carpinetum* association, and very rarely mixed acidophilous oak-pine forest *Pino-Quercetum* develop on steep and stony slopes.

In the *Tilio-Carpinetum* association, *Carpinus betulus* dominates, *Quercus robur* and *Hedera helix* also occur. The herb layer is formed by *Anemone nemorosa*, *Galeobdolon luteum*, *Ranunculus lanuginosus*, *Paris quadrifolia*, *Euphorbia dulcis*, *Majanthemum bifolium*, *Hepatica triloba*, *Luzula nemorosa*, etc. These area association exhibits the most resemblances to *Tilio-Carpinetum typicum* and simultaneously have their specific characteristics.

Stands of the mixed acidophilous oak-pine forest, *Pino-Quercetum*, are rare in the valley. *Quercus robur* and *Pinus sylvestris* dominate in the tree layer. The herb layer is sometimes dominated by *Vaccinium myrtillus* accompanied by *Majanthemum bifolium*, *Oxalis acetosella* and *Pteridium aquilinum*.

Fragments of the *Luzulo nemorosae-Fagetum* association occur extremely rarely in the valley. The tree layer is formed by *Fagus sylvatica*, *Abies alba*, and *Picea abies*. More frequent in herb layer are *Luzula nemorosa*, *Calamagrostis arundinacea*, *Oxalis acetosella*, *Rubus idaeus* and *Senecio fuchsii*. The moss layer is formed by *Polytrichum formosum*, *Dicranum scoparium*, *Leucobrium glaucum*, *Cladonia cornuta*, *Cladonia squamosa* and others.

The riverside terraces of the Kamienica river and its tributaries, are covered with Carpathian alderwood (the *Alnetum incanae* association of the *Alno-Padion* alliance) and osier thickets (the *Salicetum triandro-viminalis* of the *Salicion* alliance).

Apart from *Alnus incana*, there are single specimens of *Acer pseudoplatanus* or *Fraxinus excelsior* in the *Alnetum incanae* association. Growing quite abundantly in the shrub layer are: *Salix fragilis*, *Salix purpurea*, *Cornus sanguinea*, *Sambucus nigra*, and others. In the herb layer, *Aegopodium podagraria*, *Anemone nemorosa*, *Salvia glutinosa*, *Euphorbia amygdaloides* and *Symphytum cordatum* prevail.

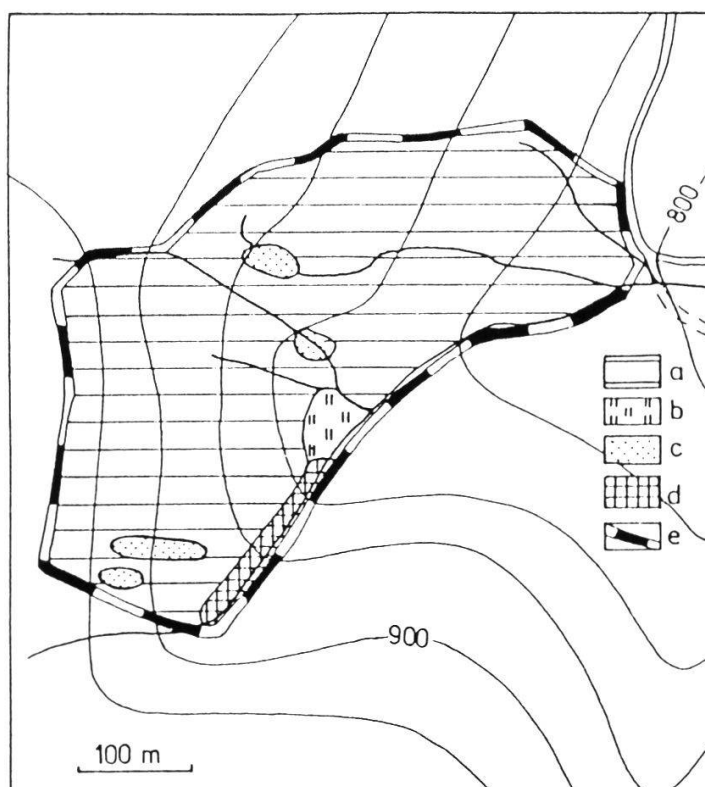
On slime-gleyed soils, swampy alder woods, *Caltho-Alnetum* of the *Alno-Padion* alliance, develop. This community is relatively rare because of the limited area of appropriate habitats. The tree layer is formed chiefly by *Alnus*

*incana*. In the herb layer, besides representatives of the *Alno-Padion* alliance, *Crepis paludosa*, *Equisetum maximum*, and others are found.

The non-forest vegetation is limited to alluvial terraces, valley bottoms, dry and stony slopes, etc. Semi-natural plant communities include rich hay meadows (the *Arrhenatheretum elatioris* association) in the submontane zone and the *Gladiolo-Agrostetum* association in the montane zone. Fertile pastures of the *Arrhenatheretalia* class are distributed in the submontane and lower parts of the montane zone and poor pastures of the *Nardetalia* class dominate over 800-850 m a.s.l.

### 3. THE "LABOWIEC" FOREST RESERVE

The strictly protected "Labowiec" forest reserve is located on the northern slopes of the Jaworzyna Krynicka Range (Fig. 1) in the source area of the Labowski stream (STASZKIEWICZ 1972). The lower border of the reserve lies at the altitude of 810 m a.s.l., the upper at 950 m a.s.l. Almost the whole reserve



**Fig. 2.** Map of plant communities in the "Labowiec" nature reserve.  
a - *Dentario glandulosae-Fagetum*, b - hay meadow, c - concentration of *Petasites albus*,  
d - riverside non-forest communities, e - reserve boundary.

**Table 1.** *Dentario glandulosae-Fagetum* in the "Labowiec" reserve.

|                                         |                |     |     |     |     |     |
|-----------------------------------------|----------------|-----|-----|-----|-----|-----|
| Field number of record                  |                | 1   | 2   | 6   | 7   | 8   |
| Altitude (m)                            |                | 790 | 900 | 820 | 875 | 925 |
| Exposure                                |                | E   | E   | -   | SE  | E   |
| Slope (%)                               |                | 5   | 10  | 15  | 35  | 15  |
| Height of trees (max., m)               |                | 30  | 30  | 35  | 35  | 30  |
| Cover of tree layer (a) (%)             |                | 100 | 100 | 90  | 90  | 90  |
| Cover of shrub layer (b) (%)            |                | 5   | 5   | 40  | 15  | 15  |
| Cover of herb layer (c) (%)             |                | 95  | 95  | 70  | 90  | 80  |
| Surface of trial plot (m <sup>2</sup> ) |                | 200 | 200 | 500 | 300 | 500 |
| <b>Trees</b>                            |                |     |     |     |     |     |
| <i>Ch. Fagion</i>                       |                |     |     |     |     |     |
| <i>Fagus sylvatica</i>                  | a <sub>1</sub> | 3.2 | 5.4 | 3.2 | 2.2 | 5.5 |
| <i>Fagus sylvatica</i>                  | a <sub>2</sub> | 1.1 | 1.1 | 2.2 | .   | 3.2 |
| <i>Fagus sylvatica</i>                  | b <sup>2</sup> | .   | .   | 3.2 | 2.2 | 2.1 |
| <i>Fagus sylvatica</i>                  | c              | .   | .   | +   | 2.2 | 1.1 |
| <i>Acer pseudoplatanus</i>              | b              | .   | +   | .   | .   | .   |
| <i>Acer pseudoplatanus</i>              | c              | .   | +   | .   | .   | .   |
| Other species                           |                |     |     |     |     |     |
| <i>Abies alba</i>                       | a <sub>1</sub> | 4.3 | 2.1 | 3.2 | 2.2 | 5.5 |
|                                         | b              | .   | .   | .   | .   | (+) |
| <b>Shrubs</b>                           |                |     |     |     |     |     |
| <i>Sambucus nigra</i>                   | b              | .   | +   | .   | .   | .   |
| <b>Herbs</b>                            |                |     |     |     |     |     |
| <i>Ch. Dentario glandulosae-Fagetum</i> |                |     |     |     |     |     |
| <i>Symphytum cordatum</i>               |                | .   | .   | 2.2 | 2.2 | +   |
| <i>Polystichum braunii</i>              |                | .   | .   | 2.1 | 2.1 | 2.2 |
| <i>Dentaria glandulosa</i>              |                | .   | .   | 1.1 | 2.1 | .   |
| <i>Ch. Fagion</i>                       |                |     |     |     |     |     |
| <i>Rubus hirtus</i>                     |                | 4.3 | 5.5 | 4.3 | 3.3 | 3.2 |
| <i>Dentaria bulbifera</i>               |                | .   | .   | +   | 1.1 | +   |
| <i>Veronica montana</i>                 |                | .   | .   | +   | 1.1 | .   |
| <i>Actea spicata</i>                    |                | +   | .   | .   | .   | .   |
| <i>Polystichum lobatum</i>              |                | .   | .   | .   | .   | +   |
| <i>Corydalis cava</i>                   |                | .   | .   | .   | .   | +   |
| <i>Ch. Fagetalia and Querco-Fagetea</i> |                |     |     |     |     |     |
| <i>Impatiens noli-tangere</i>           |                | 4.3 | +   | 2.2 | +   | 2.2 |
| <i>Geranium robertianum</i>             |                | 1.1 | +   | +   | +   | .   |
| <i>Salvia glutinosa</i>                 |                | +   | .   | +   | +2  | +   |
| <i>Galeobdolon luteum</i>               |                | .   | +   | 1.1 | 1.1 | 2.1 |
| <i>Stellaria nemorum</i>                |                | +   | +   | 1.1 | .   | 2.2 |
| <i>Asperula odorata</i>                 |                | 2.2 | 2.2 | 3.2 | .   | .   |
| <i>Asarum europaeum</i>                 |                | .   | 1.2 | 2.2 | 1.2 | .   |
| <i>Euphorbia amygdaloides</i>           |                | .   | .   | +   | +   | .   |
| <i>Circaea alpina</i>                   |                | .   | +   | .   | 1.2 | 2.2 |
| <i>Carex sylvatica</i>                  |                | .   | .   | .   | .   | +   |
| <i>Lysimachia nemorum</i>               |                | .   | .   | 1.2 | +   | .   |
| <i>Ranunculus lanuginosus</i>           |                | .   | (+) | .   | .   | (+) |
| <i>Adoxa moschatelina</i>               |                | .   | +   | .   | +   | .   |
| <i>Corydalis solida</i>                 |                | (+) | .   | .   | +   | .   |
| <i>Paris quadrifolia</i>                |                | .   | .   | +   | .   | .   |
| <i>Stachys sylvatica</i>                |                | .   | .   | .   | +   | .   |
| <b>Others</b>                           |                |     |     |     |     |     |
| <i>Athyrium filix-femina</i>            |                | +   | 2.1 | 2.2 | 3.2 | 3.2 |
| <i>Oxalis acetosella</i>                |                | 2.2 | 2.1 | 4.3 | 3.2 | 2.2 |
| <i>Dryopteris spinulosa</i>             |                | .   | +   | +   | 1.1 | 2.1 |
| <i>Epilobium montanum</i>               |                | .   | .   | .   | +   | .   |
| <i>Homogyne alpina</i>                  |                | .   | .   | 1.2 | .   | .   |

consists of beech and fir tree stands, with a diversely proportional distribution of these species at various places. The age of the tree stands ranges from 120 to 270 years, with most of the trees being 120-140 years old. Single trees occur with a circumference of over 300 cm. In the last few years most of the aged fir trees have died. The canopy is vast, achieving 85-90%. The shrub layer is poorly developed. The only forest association in the reserve is represented by *Dentario glandulosae-Fagetum* (Fig. 2 and Table 1). Besides that, small patches of non-forest communities occur such as hay meadows and swamps. Among the plants occurring here, the following are frequent: *Chaerophyllum hirsutum*, *Impatiens noli-tangere*, *Lysimachia nummularia*, *Senecio fuchsii*, *Veronica montana*, *Circaea lutetiana*, *Equisetum silvaticum*, *Caltha palustris*, *Cirriphyllum piliferum*, *Rhytidiadelphus triquetrus*, *Climacium dendroides* and *Plagiothecium roeseanum*. The complete list of bryophytes includes 107 taxa (MICKIEWICZ 1969). Especially well represented is the moss flora of old trees and fallen trunks.

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