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TYPE REGION P-c: LOW BESKIDY MTS.

Location: longitude±21°00′—22°00′ E, latitude±49°15′±49°50′N.
Area: ±1830 sq. km.
Length: ±100 km, maximal width±30 km.
Altitude: 300—999 m a.s.l.
Climate (Gumiński 1950; Hess 1965; Hess et al. 1976): mean January temperature —3.7 to —3,9°C in submontane zone (300—500 m a.s.l.), — 6.2 to —7.0°C at valley bottoms (400—500 m a.s.l.), —6.5°C in upper parts of mountains, mean July temperature 18.0°C in submontane valleys, 14.1°C in upper parts of mountains, mean annual temperature ± 8.0°C in valleys, ±4,0°C in upper parts of mountains; mean annual rainfall 700—900 (1000) mm.
Two climatic altitudinal zones are distinguished: moderately warm and moist with mean annual temperatures from 6 to 8°C and moderately cool and moist with mean annual temperatures 4—6°C. A boundary between them runs at 500—570 m a.s.l.
Geology (Klimaszewski 1935, 1946; Starkel 1960, 1972): Carpathian flysch of Lower Cretaceous to Oligocene age; Young Quaternary clay-stony layers.
Topography: the lowest and narrowest part of the Carpathians. The ridges run, in majority, in SE-NW direction. The highest peaks (999 and 862 m a.s.l.) are situated at western and eastern flank of the range while in the central part they reach only 520—750 m a.s.l.
Population: approx. 84 persons/sq. km; villages, small towns.
Vegetation (Grodzińska & Pancer-Kotejowa 1965; Grodzińska 1968; Pawłowski 1972; Święs 1980, 1982): forests cover 35—50% of the area. The highest ridges are also the most afforested parts of the region. The mesotrophic plant communities dominate in the landscape. An altitudinal zonation is observed mainly in forest communities. The typical community of submontane zone is *Tilio-Carpinetum* and of the low montane zone *Dentario glandulosae-Fagetum*. In the submontane zone and lower parts of the montane zone a mixed forest rich in tree species, described in the literature as *Rubus hirtus—Abies alba* community, is rather important. Besides seminatural meadow communities of order *Arrhenatheretalia* and *Molinietalia*, vast areas are occupied by anthropogenic communities of undefined phytosociological position. The flora and vegetation of the region show the intermediate features between Eastern and Western Carpathians.
Soils: the diversified acid and leached loamy brown soils are dominant in the region.
Colonization and husbandry (Machnik 1960, 1962; Żaki 1955): the beginnings of colonization date back to the Younger Neolithic. The remnants of rather abundant settlements of the Bronze Age were found. Between 13th and 15th centuries the

area was very densely populated. A significant depopulation happened after 1947. At present small farms and small and medium industry are typical for the region.
Reference site 1: Jasiel (Szczepanek 1987).
Location: longitude 21°53′13″E, latitude 49°22′22″N.
Altitude: 670—680 m a.s.l.
Age range: 10 340±110 to 0 B.P. Mesotrophic peat-bog (depth of deposits: 2.5 m), situated on a watershed, represents montane region of the Low Beskidy Mts. 8 site pollen assemblage zones; 6 ^{14}C dates.
Two pollen diagrams from mesotrophic deposits of Jasiel peat-bog were published (Szczepanek 1987). There is one more Young Holocene diagram published from this region (Cergowa Góra site — Więckowski & Szczepanek 1963).
The pollen diagram (Fig. 1).

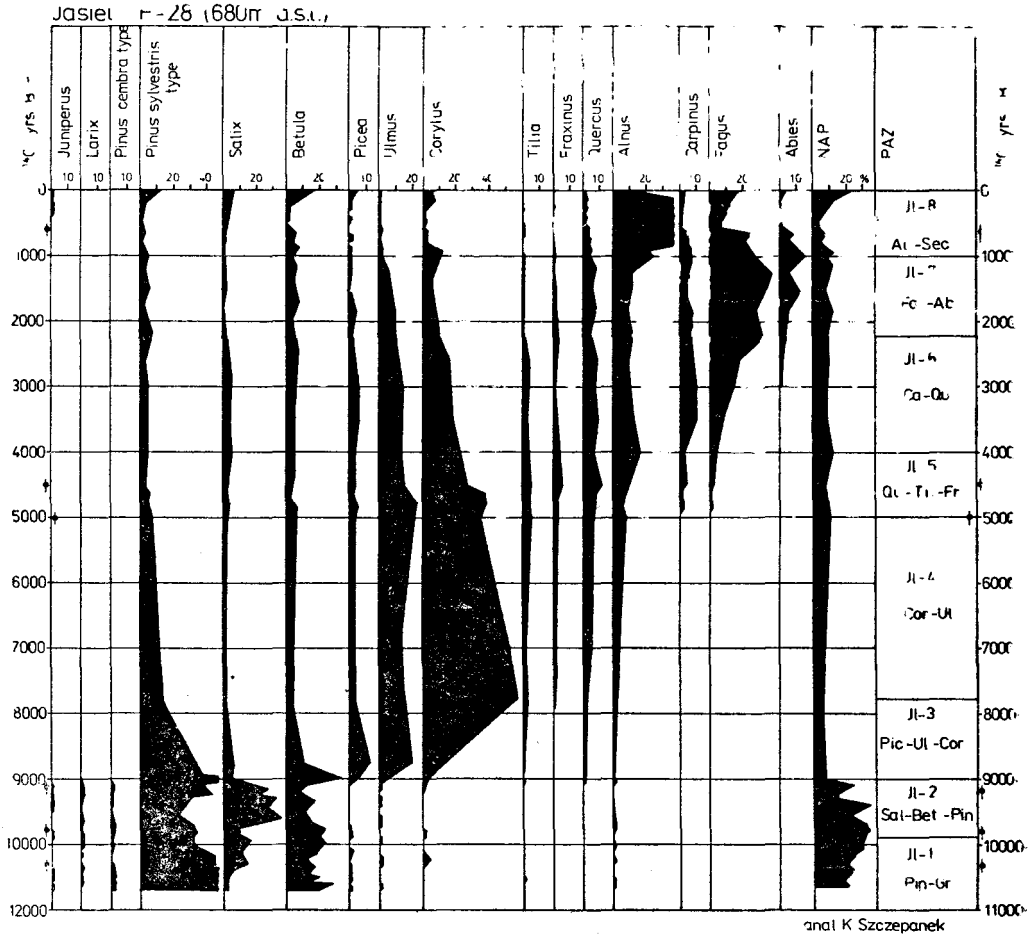

Fig. 1

J—1 ±10 700—10 100 B.P. *Pinus-Gramineae*
J—2 10 100— 9 000 B.P. *Salix-Betula-Pinus*
J—3 9 000— 7 750 B.P. *Picea-Ulmus-Corylus*
J—4 7 750— 5 000 B.P. *Corylus-Ulmus*
J—5 5 000— 4 000 B.P. *Quercus-Tilia-Fraxinus*

J—6 4 000— 2 200 B.P. *Carpinus-Quercus*
J—7 2 200— 1 050 B.P. *Fagus-Abies*
J—8 1 050— 0 B.P. *Alnus-Secale*

DISCUSSION

Local vegetation:

1. A dominance of *Pinus*, *Betula*, *Salix* and *Gramineae* and an occurrence of *Larix* and *Juniperus* are typical for the decline period of Late Glacial. The presence of *Pinus cembra* was confirmed by the wood fragments found in peat.
2. From ca. 9800 B.P. the increasing pollen concentration, especially of *Salix*, *Pinus*, and *Betula*, indicates the progressing afforestation.
3. At approx. 9000 B.P. *Pinus cembra*, *Larix* and *Juniperus* disappear, *Pinus* and *Betula* dominate. *Salix* declines (a considerable decrease in *Salix* pollen concentration).
4. From ca. 9100—9000 B.P. *Picea* and *Alnus* expanded. Very distinct increment of pollen concentrations of *Ulmus* and *Corylus* evidences a quick taking up the land by forest communities.
5. From ca. 8800 to 4500 B.P. the mixed deciduous forests with *Ulmus*, *Quercus*, *Tilia*, *Fraxinus* (from approx. 7000 B.P.), *Alnus* (increase from approx. 7000 B.P.) and *Corylus* in undergrowth dominate. The mire surface is covered with reed or sedge communities (*Phragmites* and other *Gramineae*, *Carex*, *Filipendula*).
6. At ca. 4900 B.P. *Acer*, *Carpinus* and *Fagus* appear.
7. From ca. 4500 to 3000 B.P. the contribution of *Picea* increases.
8. From ca. 4500 B.P. the changes in forest communities progress, *Corylus*, *Ulmus* decline.
9. From approx. 4000 to 2200 B.P. *Quercus* and *Carpinus* forests with the contribution of *Ulmus* and *Corylus* dominate. The proportion of *Fagus* rise.
10. At ca. 4000 B.P. *Abies* and first pollen grains of *Secale* and *Cerealia* appear.
11. From approx. 2500 B.P. a continuous occurrence of human indicators i.e. *Plantago lanceolata*, *Rumex*, *Secale*, *Cannabis* is recorded. The importance of *Gramineae* rises. The total pollen concentration declines.
12. From ca. 2200 to 500 B.P. *Carpinus*, *Fagus*, *Abies* and *Quercus* dominate. *Picea*, *Tilia*, *Ulmus*, *Fraxinus* and *Corylus* decline.
13. From ca. 900 B.P. an impact of human economy increases and further changes in forest communities composition take place (the continuous pollen curves of *Picea*, *Tilia* and *Fraxinus* disappear). The concentration of *Alnus* pollen increases.
14. From approx. 600 B.P. *Quercus*, *Carpinus*, *Fagus* and *Abies* decline; a considerable increase of *Alnus*.
15. From approx. 400 B.P. *Alnus* declines, while *Plantago*, *Rumex* and *Secale* rise.

Hydrology—Climate:

1. Since the formation of the pool at ca 10 700 B.P. to ca 9900 B.P. a high proportion of mineral matter in deposits may indicate a high humidity of climate and/or great importance of washout processes.
2. From 9900 to 9500 B.P. the rainfalls probably decrease and temperatures rise.
3. From 9000—8900 B.P. the increase of temperatures and decrease of rainfalls progresses. The rates of deposit accumulation decrease very distinctly (till approx. 5000 B.P.). A high proportion of mineral matter in deposits may be connected with high rates of peat humification.

4. After 5000 B.P. the peat accumulation rate increase slowly. The proportion of *Sphagnum* rises a little. Insignificant cooling.
5. From approx. 2200 B.P. an increase of humidity and a decrease of temperatures is recorded. A considerable acceleration of peat accumulation rate took place then.

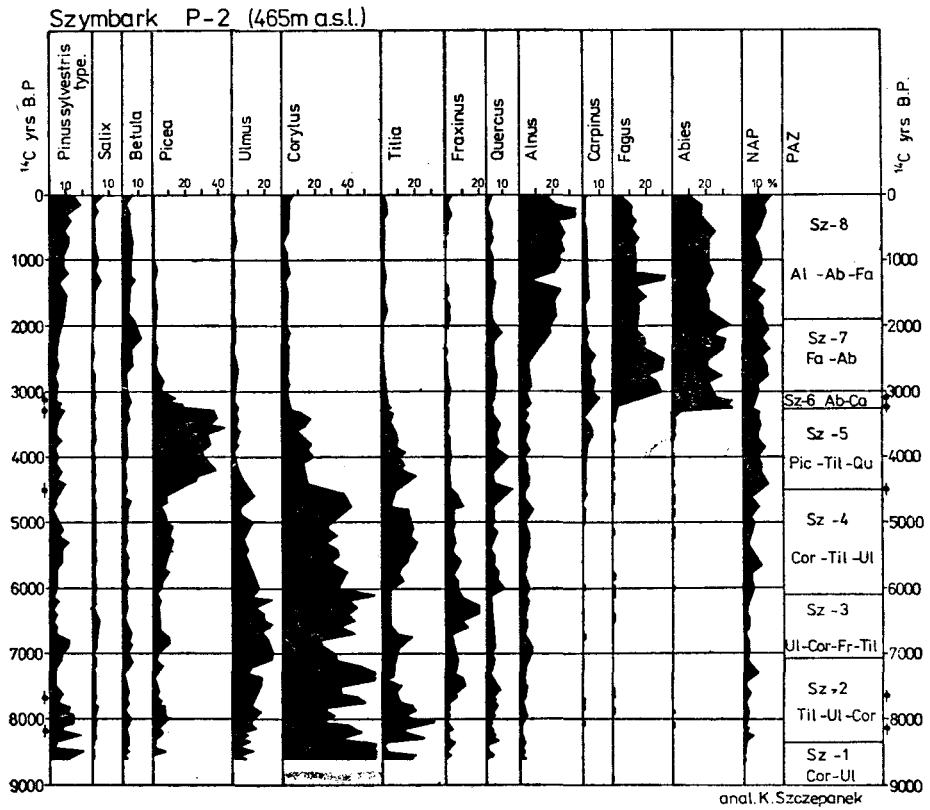

Fig. 2

Reference site 2: Szymbark (Gil et al. 1972; Gil et al. 1974).
Location: longitude 21°06'E, latitude 49°38'N.
Altitude: 465 m above sea level. Age range: ±9500 to 0 B.P. Mesotrophic peat bog (depth of deposits: 5 m), situated in a laudslide niche, represents submontane region of the Low Beskidy Mts. 8 site pollen assemblage zones, 5 ^{14}C dates.
The pollen diagram (Fig. 2).

Sz—1 ±8600—8300 B.P. *Corylus*
Sz—2 8300—7050 B.P. *Tilia-Ulmus-Corylus*
Sz—3 7050—6050 B.P. *Ulmus-Corylus-Fraxinus-Tilia*
Sz—4 6050—4500 B.P. *Corylus-Tilia-Ulmus*
Sz—5 4500—3300 B.P. *Picea-Tilia-Quercus*
Sz—6 3300—3000 B.P. *Abies-Carpinus*
Sz—7 3000—1900 B.P. *Fagus-Abies*
Sz—8 1900— 0 B.P. *Alnus-Abies-Fagus*

DISCUSSION

Local vegetation:

1. Before 8300 B.P. *Corylus* was the dominant species with the considerable contribution of *Ulmus* and other thermophilous trees present in the forests. The presence of *Tilia* and *Picea* was confirmed by macrofossils.
2. From approx. 8300 B.P. the proportion of *Corylus* declines while *Ulmus*, *Tilia* and *Picea* rise.
3. From 8300 to 4500 B.P. mixed deciduous forests composed of *Ulmus*, *Tilia*, *Quercus*, *Fraxinus*, *Alnus* with *Corylus* in undergrowth dominate. A high proportion of *Polypodiaceae*, *Cyperaceae* and *Gramineae* in the herb layer is recor-

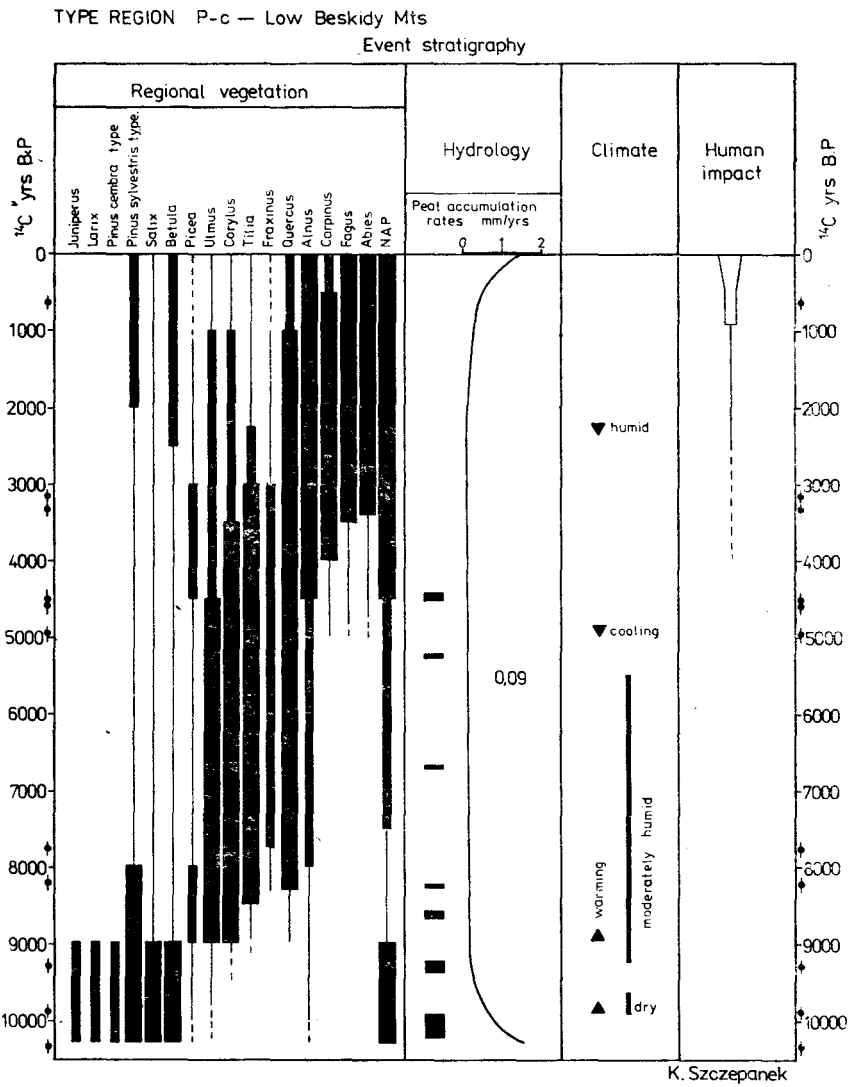

Fig. 3

ded. The abundant macrofossils of *Carex* sp. div., *Lycopus europaeus*, *Scirpus sylvaticus*, *Solanum dulcamara*, *Urtica dioica*, *Polygonum hydropiper*, *Ranunculus* repens were found especially by the end of this period.

4. From ca. 5000 B.P. *Carpinus* occurs continuously.
5. At ca. 4500 B.P. *Corylus* and *Ulmus* decline, *Picea* dominates.
6. At approx. 4000 B.P. *Tilia* and *Fraxinus* decline. *Carpinus* starts expanding.
7. At ca. 3300 B.P. a decline of *Picea* and further definite decline of *Corylus* is recorded. *Carpinus* and *Fagus* dominate.
8. From approx. 2500 B.P. an increase of *Pinus*.
9. From approx. 2400 B.P. *Carpinus* declines.
10. From ca. 2000 B.P. *Alnus* increases; *Quercus*, *Carpinus* and *Fagus* decline.
11. From approx. 3200 B.P. *Rumex* and *Plantago lanceolata* occur.
12. From approx. 1200 B.P. *Secale* occurs.

Hydrology — Climate:

1. At ca. 8600 B.P., probably as a result of wet climate, a landslide takes place.
2. The several silt layers found in the peat profile record probably the phases of landslide activation caused by increased precipitation. They are recorded at ca. 8300 B.P., 6700 B.P., 5300 B.P., and 4500 B.P.

General and unique patterns (Fig. 3):

1. The warming of climate and the rise of humidity before ca. 9900 B.P. find reflection in geomorphological processes i.e. in forming the mineral layers in biogenic deposits. The climatic and hydrological changes stimulated the expansion and closing up of rather loose vegetation in upper elevations. At Szymbark from at least ca. 8600 B.P. the occurrence of thermophilous trees is confirmed by macrofossils.
2. From approx. 9000 to 4500 B.P. the mixed deciduous forests with dense undergrowth consisting of *Corylus* and other shrubs dominate.
3. A significant decrease of peat accumulation rate at Jasiel site is a very distinct feature of wider geographical range in this period. This phenomenon does not occur at Szymbark because of quite different geomorphological situation of the site.
4. The changes in composition of forest communities at ca. 5000 B.P. are the common features of vegetational development. They are expressed by the decline of *Corylus* and *Ulmus* and expansion of *Carpinus*, *Fagus* and *Abies* (in lower parts of mountains).
5. A high contribution of *Picea* at Szymbark, which is very typical for this region (both in montane and submontane zone) between 4500 B.P. and 3350 B.P. is not so distinct but clearly visible at Jasiel. This is probably connected with rising of the groundwater level in the peat bog.
6. At approx. 3000 B.P. the zonal pattern of forest communities (submontane and montane zones) was formed.
7. Probably at approx. 2500—2200 B.P. a colonization of the region by pastoral and agricultural tribes took place and a deforestation began. At ca. 1700—1300 B.P. the more intensive deforestation and the expansion of *Alnus* on abandoned fields is observed. From ca. 1200 B.P. a continuous cultivation of *Secale* began.

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