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TYPE REGION P-j: ŚWIĘTOKRZYSKIE MTS. (HOLY CROSS MTS.)

Location: longitude c. 20°17′—21°17′E, latitude c. 50°04′—51°34′N.
Area: approx. 3500 sq. km.
Length: c. 70 km, width c. 50 km.
Altitude: c. 200—611 m above sea level.
Climate: mean annual temperatures 5.7—7.6°C, mean January temperatures —1.9 — —4.9°C, mean July temperatures 16.2—18.4°C; precipitation 600—750 mm.
Geology: Carboniferous sedimentary rocks to Pleistocene glacial sediments.
Topography (Gilewska 1972; Klatka 1965; Radłowska 1967): a region of old folded mountains with the highest peak reaching 611 m a.s.l. Paralell ridges running generally NW-SE are the main feature of the region. The ridges are separated by broad depressions and valleys modelled in less resistant rocks. They are also dissected by diagonal valleys and forming a typical ridge-and-valley pattern of territory relief. The geological structure of the region shows a zonal patterns. The highest range (611 m a.s.l.) is built of Cambrian quartzites. The lower ranges (350—450 m a.s.l.), built of Cambrian and younger Palaeozoic rocks, run to the south and north of the main ridge. The lowest, external level is formed by ridges of 300—350 m a.s.l., built of Mesozoic rocks.
Population: c. 120 people/sq. km, approx. 45% in towns.
Vegetation: the vegetation of the region is very diversified. Approx. 23—35% of the area is covered by forests. The fir and mixed beech-fir (*Abietetum polonicum* and *Dentario glandulosae-Fagetum*) forests occur on the main ridges. The slopes of lower ranges and valleys are covered by deciduous oak-hornbeam forests and moist alder woods, mixed oak-pine forests, pine forests, moist pine forests, and meadow communities. Thermophilous communities and xerothermic species are more abundant on calcareous grounds with a more diversified relief. A great peculiarity of the region is the high contribution of *Larix polonica* in the forests. North-eastern limits of *Fagus*, *Abies* and *Picea* ranges run through this territory.
Soils (Strzemski 1967): there are 7 lithological and pedological subregions distinguished on the basis of distribution of rock types and soils developed of them. The most widely distributed are very acid and acid soils (approx. 51%) and slightly acid soils (approx. 28%). Neutral and alkaline soils cover less than 20% of the area.
Colonization and husbandry: the oldest traces of man's residence and activity (Palaeolithic) in the region are dated from 50—60 000 B.P. The old flint mines date back to 4000 B.P., while the remains of iron works — to 1900—1500 B.P. A landscape is of the agricultural-industrial type with small farms and medium and big industry dominating in the region.
Reference site 1: Słopiec (Szczepanek 1961, 1982).
Location: longitude 20°47′E, latitude 50°47′N.

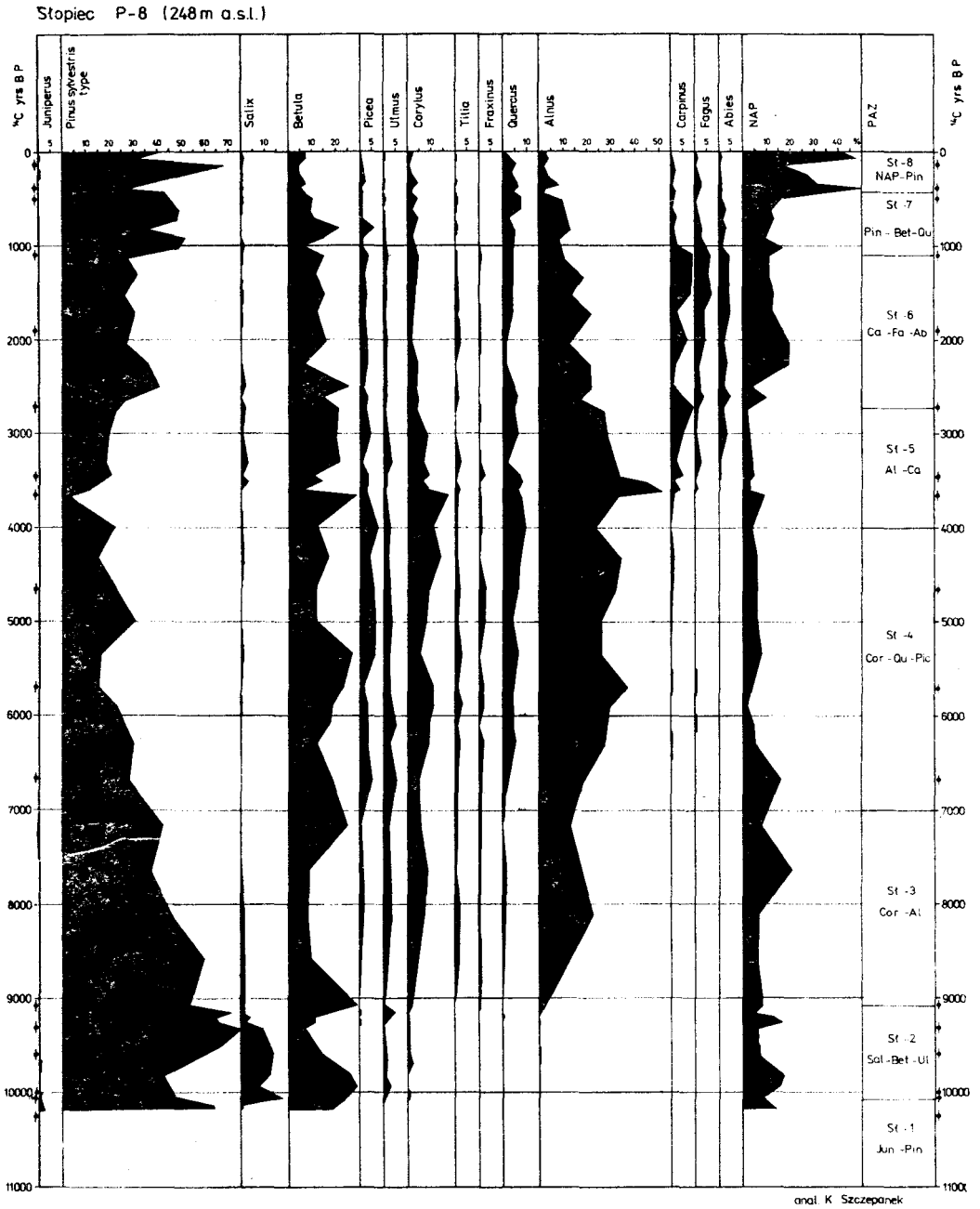

Fig. 1

Altitude: 248 m a.s.l.
Age range: 10 280±210 to 0 B.P. Mesotrophic peat-bog. 8 site pollen assemblage zones. 17 ^{14}C dates.
The pollen diagram (Fig. 1, 2). Only one diagram is presented. For detailed results of palynological investigations see Szczepanek 1961, 1971, 1982.

Sł-1 10280—9900 B.P. *Juniperus-Pinus*
Sł-2 9900—9100 B.P. *Salix-Betula-Ulmus*
Sł-3 9100—7000 B.P. *Corylus-Alnus*
Sł-4 7000—4000 B.P. *Corylus-Quercus-Picea*
Sł-5 4000—2700 B.P. *Alnus-Carpinus*
Sł-6 2700—1100 B.P. *Carpinus-Fagus-Abies*
Sł-7 1100— 400 B.P. *Pinus-Betula Quercus*
Sł-8 400— 0 B.P. NAP-*Pinus*

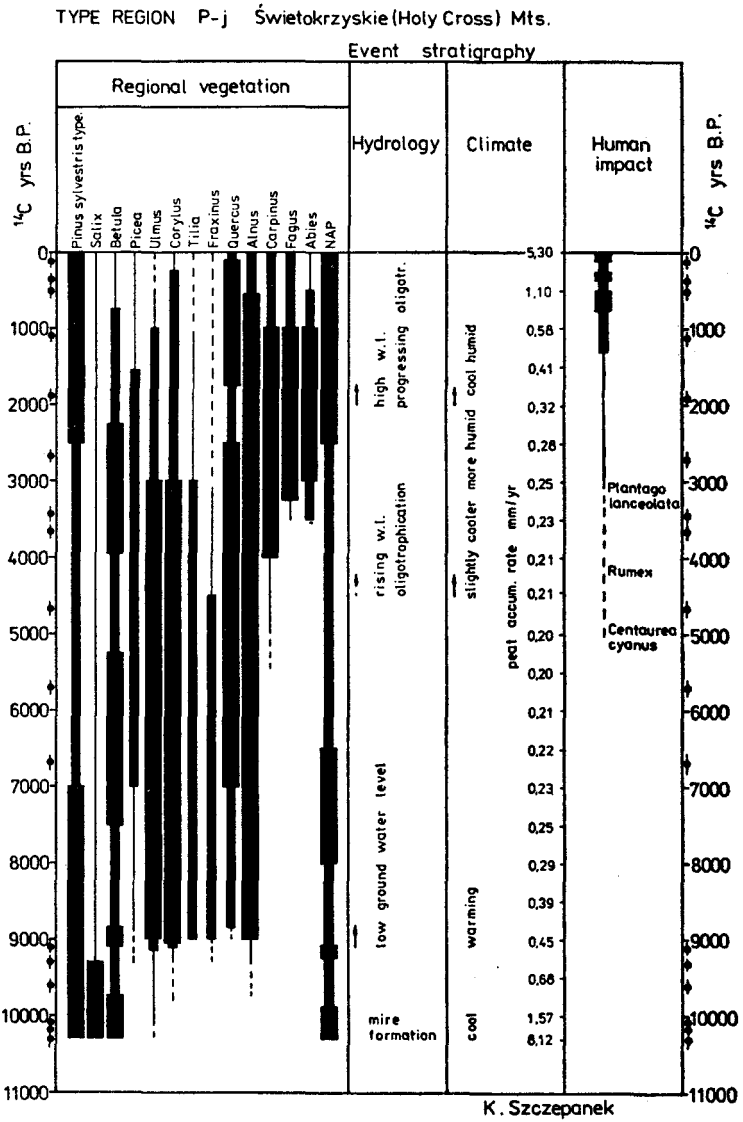

Fig. 2

DISCUSSION

Local vegetation:

1. The forests with dominant *Pinus, Betula, Salix* and admixture of *Larix, Salix* and, for a short time also *Populus*, are typical for the decline period of the Late Glacial and the beginning of Holocene (10 300 to ±9900 B.P.). Macrofossils of *Betula carpatica, B. tortuosa, B. nana* and *B. verrucosa* indicate a great role of boreal element.
2. From approx. 9900 B.P. *Pinus* curve declines; *Corylus* appears; the contribution of *Ulmus*, present from 10 300 B.P., slightly increases.
3. From approx. 9300 B.P. *Salix* declines; *Alnus, Corylus* and *Fraxinus* become widely distributed.
4. From approx. 9000 B.P. *Betula* declines; *Alnus* curve increases; *Tilia* appears.
5. From approx. 9000 to approx. 4000 B.P. deciduous and mixed forests with high proportion of oligotrophic and heliophilous *Pinus* and *Betula* dominate. In this period to approx. 7000 B.P. the contribution of local mire vegetation (*Gramineae* and *Cyperaceae*) is very important. The increase of *Picea, Alnus, Betula, Quercus* and *Ericaceae*, observed after 7000 B.P., may be connected with the lowering of groundwater level and overgrowing of the basin.
6. From ca. 5500 (5000) B.P. *Carpinus* expands.
7. From ca. 4500—4300 B.P. *Ulmus* curve declines indistinctly, while the curves of *Betula, Alnus, Carpinus* and *Corylus* rise. There are some charcoal layers in the profile. This fact may be connected with colonization of the region by tribes practicing cattle grazing and agriculture (single pollen grains of *Rumex* and *Centaurea cyanus*).
8. At ca. 3750 B.P., after short culmination, *Alnus* curve declines, while those of *Betula, Pinus* and *Salix* rise.
9. From approx. 3500 B.P. *Fagus* and *Abies* expand.
10. From approx. 3000 B.P. *Ulmus* and *Corylus* decline significantly; *Carpinus, Abies, Fagus* and *Alnus* dominate.
11. At approx. 2700 B.P. the curves of culture indicators (*Secale, Cannabis, Rumex* and *Plantago lanceolata*) rise. The *Gramineae* curve rises also. *Alnus* declines.
12. At 1100 B.P. almost all deciduous tree curves decline except *Quercus. Pinus* and *Betula* curves rise. Herbaceous plants (including cultivated plants and weeds) dominate.
13. At ca. 400 B.P. an intensive deforestation of the region and development of agriculture is recorded.

Hydrology — Climate:

1. At approx. 10 300 B.P. a change of the hydrological conditions in the Belnianka stream valley occurred — a pool was formed.
2. Between 10 300 and 9000 B.P. landslides affecting the marginal parts of the peat bog take place (lenses of silt were found in the test borings).
3. At approx. 9000—9100 B.P. a lowering (and stabilizing) of the groundwater level and a warming of climate take place. These conclusions are supported by the facts of overgrowing the pool by sedge mire, a considerable expansion of *Alnus* and *Betula*, and also by expansion of *Corylus* and thermophilous trees.
4. From approx. 8500 B.P. the rate of peat accumulation decreases significantly. The lowest rate of sedimentation is observed at approx. 5500 B.P., followed by a slow increase and from 4500 B.P. a considerable acceleration. The warm climate and the seasonal fluctuations of water level probably stimulated the humification of plant remains.
5. At approx. 4500—4000 B.P. a progressing oligotrophication of the pool connected

with the expansion of *Sphagnum* mosses and increase of peat accumulation rate is observed.

6. At approx. 2000 B.P. the groundwater level rises and a shallow lake appears.
7. At approx. 500 B.P. an intensive oligotrophication of the pool, followed by the overgrowing of its surface by *Sphagnum* mosses. These phenomena are probably connected with the progressive cooling and rise of climatic humidity.

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