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EWA MADEYSKA

TYPE REGION P-f: SUDETES MTS.-BYSTRZYCKIE MTS.

Situation: ±16°—16°41'E longitude, ±50°40'N latitude.
Altitude: 200—1084 m a.s.l.
Climate: mean annual temperatures +4,4 — +7.5°C (at Zieleniec +4.4°C), mean January temperatures —6 — +3°C, mean July temperatures +16 — 17.5°C. Precipitation 700—1321 mm/year (at Zieleniec 1321 mm/year). Length of veg. period 100—210 days. Type of climate: mountain, with some oceanic tendencies; frequent foens.
Geology: The Central Sudetes are a tectonic syncline surrounded from the north and south with the Pre-Cambrian metamorphic blocks of the Sowie Mts., Orlickie Mts., and Bystrzyckie Mts. formed of composite gneisses with granites, pegmatites, amphibolites and serpentinites. The syncline is filled with Devonian deposits (fleck-schiefers, greenschists and sandstones), poorly resistant Carboniferous deposits and very resistant Permian rocks composed of conglomerates, black shales, red sandstones and limestones with traces of reptiles and plant remains; volcanic rocks deposits such as porphyries and melaphyres originate also from that period. The Cretaceous formations are represented by sandstones and the Tertiary by sedimentary and volcanic rocks. During the Quaternary silts, clays, gravels were deposited in the river valleys.
Topography: old mountains often with flat summits and steep slopes.
Population: on the average over 100 inhabitants/km^2.
Soils: wide litological and geomorphological diversity of this area conditions a big variety of the mountain soils of the podzolic, acid and brown types. Whereas the bottom of the Kłodzko Basin is partly covered by loess, that is the substratum of the good soils (rendzinas).
Vegetation: the specific soil and climatic conditions are characteristic for particular mountain ranges of the Sudetes Mts. Because of dominant acid granite and porphyry rocks, the habitats with poorest soils, occupied by mixed mountain conifer forests and mountains conifer forests prevail (totally 53.7%).
In the system of vegetational zones in the Sudetes the limits between zones run generally lower by about 250 to 300 m than in the Carpathian Mts.:
— the foothill zone ranging up to 400 (500) m a.s.l. is occupied by *Carpinion* and *Pino-Quercion* communities;
— the lower montane zone — 400 (500) to 1000 m a.s.l. — is formed by mixed spruce mountain forests, less frequently by communities of acid beech forests (*Luzulo-Fagetum*). At present, planted spruce is the dominating species here. The remnants of natural beech forests are protected in some nature reserves. At the transition between the lower and upper montane zone mixed fir and spruce forests (*Abieti-Piceetum montanum*) occur;

— the upper montane zone — 1000 to 1250 (1300) m a.s.l. — is formed by vast spruce forest communities (*Piceetum hercynicum*) with some contribution of *Sorbus aucuparia* and exceptionally *Fagus*. In the lower and upper montane zones the raised-bogs occur, with *Pinus uliginosa* at the upper forest limit (the Karkonosze Mts.), and with spruce, often in variety *Picea excelsa* var. *turfosa*, in lower regions;
— the subalpine zone (*Pinetum mughi sudeticum*) — 1250 to 1450 (1500) m a.s.l., and alpine zone (*Cetrario-Festucetum supinae*) above 1500 m a.s.l. do not occur in the Central Sudetes.

Land use: rye, potatoes.
Settlement: the earliest findings are single stone tools from the Neolithic. According to the present investigations the earliest colonization took place in the Kłodzko Basin (Xth cent.). On the deforested territories in the mountains and on the foothills forestfield villages were usually established; in the middle of the XIII th cent. there existed already strongholds (Wytyczak 1981).
Reference site: Zieleniec peat-bog, the one of the bigest (ca. 150 ha) mountain raised bog in the Sudetes Mts.
Situation: ±16°24'E longitude, ±50°21'N latitude.
Elevation: 750 m a.s.l.
The history of Zieleniec peat-bog development was also described in the papers by Stark and Overbeck (1929), Stark (1936) and Kuźniewski (1962).
Age range: ca. 9000—0 B.P. Dates ^{14}C number 6.
The following 9 pollen assemblage zones have been distinguished:

ZL 1	9000—8500 B.P.	*Pinus -Salix*
ZL 2	8500—8050 B.P.	*Corylus-Betula*
ZL 3	8050—6150 B.P.	*Corylus-Picea*
ZL 4	6150—5650 B.P.	*Corylus*
ZL 5	5650—4400 B.P.	*Corylus-Picea*
ZL 6	4400—3750 B.P.	*Picea-Fagus*
ZL 7	3750—3300 B.P.	*Fagus-Carpinus-Abies*
ZL 8	3300—2300 B.P.	*Fagus-Abies*
ZL 9	2300— 0 B.P.	*Fagus-Abies-Cerealia*

DISCUSSION

During the earliest period recorded in the pollen profile (Fig. 1) from about 9000 B.P. to about 8500 B.P. the forests were composed of *Pinus* and *Betula* with some contribution of *Salix* and *Populus* and with small but gradually increasing participation of *Ulmus* and *Corylus*. In the first phase of that period open communities occupied still considerable areas. The initial peat forming communities are represened by aquatics: *Potamogeton*, *Nuphar*, *Alisma* and telmatophytes: *Menyanthes* (phase Aquatic I — Fig. 2) and also *Cyperaceae* and *Polypodiaceae*.

During the period from about 8500 B.P. to 8050 B.P. *Corylus* expanded, the participation of *Betula* was still high, but *Pinus* retreated gradually. The increasing contribution of *Corylus*, *Picea*, and of elements of deciduous mixed forest (*Ulmus*, *Quercus*, *Tilia*, *Fraxinus*, and *Acer*) indicate climatic changes. The warming up is reflected in appearance of the first, still very scarce pollen grains of forest shrubs — *Viburnum*, *Sambucus*, *Rhamnus* and of *Hedera* and *Viscum*.

From about 8000 B.P. the participation of *Picea* increased in the upper mountain regions; the areas covered with mixed deciduous forest (*Tilia*, *Quercus*, *Ulmus*, *Fraxinus*) extended in lower parts. The mire changed into a raised bog.

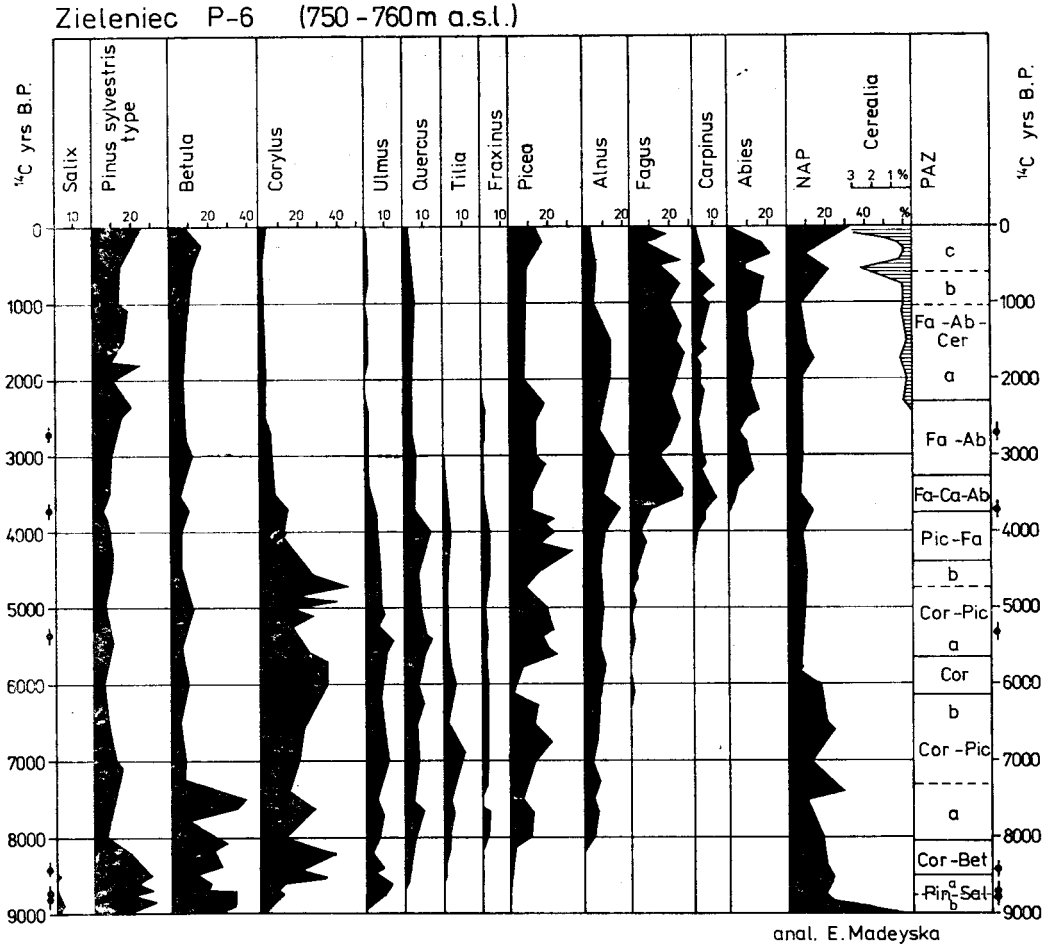

Fig. 1

From about 5370±70 B.P. the contribution of *Ulmus* and *Tilia* decreased, and *Fagus* appeared, increasing in value systematically. The pollen diagram records the dominance of spruce forests, and a considerable participation of *Corylus* with repeatedly fluctuating mutual proportion of these two taxa (each maximum of *Corylus* corresponds with a decrease in *Picea* value and also with an increase in *Ericaceae* pollen values).

From about 3700±60 B.P. the beech forests with rapidly increasing contribution of *Abies* start to expand and *Picea* and *Corylus* retreat. At the same time marked spread of heathland is noticed. These phenomena indicate climatic changes. The period from 3700±60 B.P. to about 2720±80 B.P. was characterized by a decrease in peat accumulation rate, but after 2700 B.P. the peat-bog started to develop quicker; this may have been connected with increase in humidity.

From about 4200 B.P. the culture indicators appear in the pollen diagram regularly. The interpretation of their first appearance is, however, rather difficult since, some of them e.g. *Plantago lanceolata*, appeared for the first time as early as about 8400 B.P. thus, it might grow at that time in natural communities. According to the

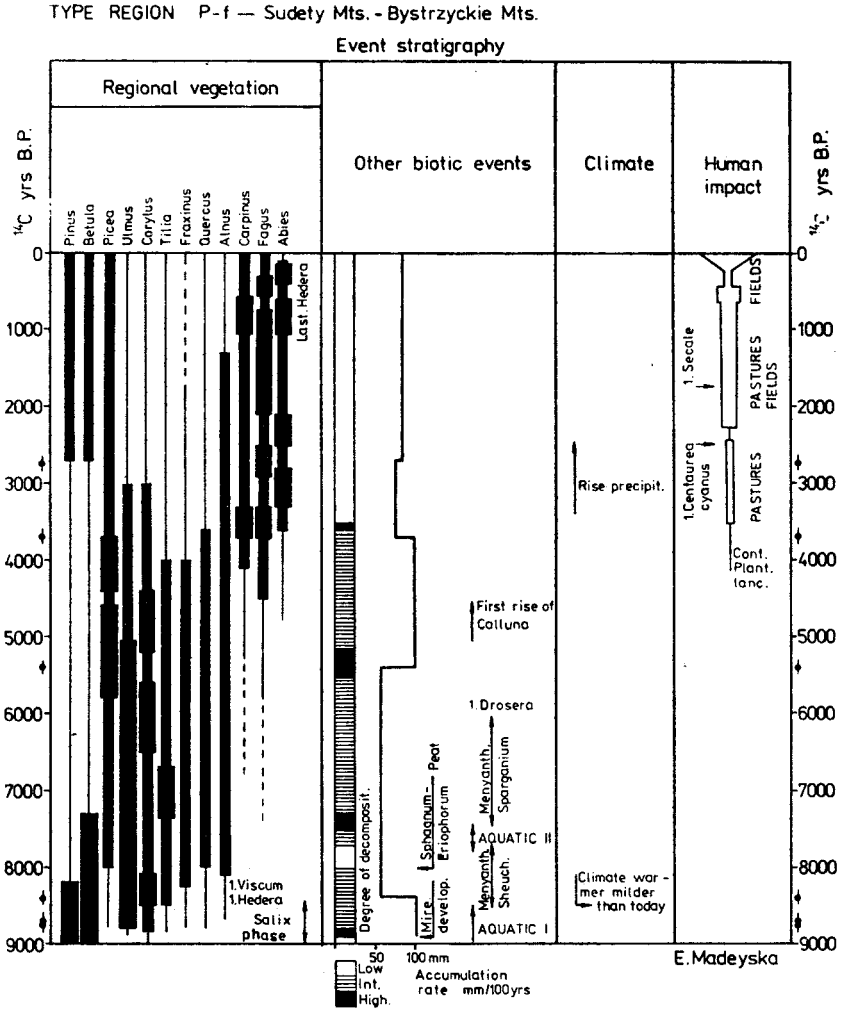

Fig. 2

archaeological data till the middle of XIIIth cent. the geographical environment of the higher elevations of the Bystrzyckie Mts. was subjected to very small anthropogenic transformations. In pollen diagrams the first pollen grain of *Centaurea cyanus* is recorded at about 2100 B.P. and the first grain *Secale cereale* at about 1700 B.P. (interpolated date). The evident deforestation (the depressions of *Fagus* and *Abies* pollen curves) and increase in pollen values of nitrophilous plants (*Artemisia*, *Chenopodiaceae*) and acidiphilous ones (*Calluna*, *Rumex acetosella*) is recorded only in the youngest section of the diagram, since ca. 600 B.P.

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REFERENCES

Kuźniewski E. 1958. Torfowisko Zieleniec k. Dusznik. Rocz. Ziemi Kłodzkiej, 3: 169—211.

— 1962. Analiza palynologiczna torfowiska Zieleniec k. Dusznik (summary: Palynological analysis of the bog at Zieleniec near Duszniki). Kwart. Opolski, Zesz. Przyr., 2: 115—143.

Stark L. 1936. Zur Geschichte der Moore und Wälder Schlesiens in postglazialer Zeit. Bot. Jahrbücher, 67 (5): 493—640.

Stark P. & Overbeck F. 1929. Zur Waldgeschichte Schlesiens. Planta, 8 (3): 341—363.

Wytyczak R. 1981. Rola osadnictwa w wylesianiu Sudetów w XIII i XIV w. na przykładzie międzyrzecza Bobru i Bystrzycy (summary: The role of settlement in disaforestation of the Sudetes Mts. in the 13th and 14th cent.). Czas. Geogr., 52: 31—43.