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TYPE REGION P-e: THE BIESZCZADY MTS.

Location: longitude 22°0—22°55′ E, latitude 49°0±49°20′N.
Altitude: 420—1348 m a.s.l.
Climate: moderately cool mountain climate, ca. 7% of area above 1000 m a.s.l. with cool mountain climate; more continental than in W Carpathians, with distinct SE—NW differences; mean January temperatures —5,2 — —4,7°C, mean July temperatures 16,0—14,8°C, mean annual temperatures 4.9°C (SE) — 7°C (NW). Annual rainfall 800—1000 mm (summer rainfall higher by more than 100% than winter rainfall). Growing season 190 days. South winds 30%, north winds 14%, calms 36%; frequent local foehns.
Geology: Carpathian Flysch — Upper Cretaceous shales and Inoceramus sandstones predominate in SW part and Young Paleogene menilitic sandstones and Krosno layers in E part. All bedrock except for menilitic formations is rich in $CaCO_3$ (up to 39%). Quaternary systems of gravel-clay terraces in valleys; thin layers of Holocene slope-wash on remnant ridges, often bare on tops.
Topography: The Bieszczady Mts. (Polish part) consist of parallel NW-SE ranges with steep slopes, dissected by perpendicular gorges of deep river valleys, which are generally wet while the slopes are rather dry. In the east the area borders on the wide and flat valley of upper San river (state frontier), and in the west on Osława river valley and Łupkowska Pass, regarded as the boundary between the West and East Carpathians. The height of ridges increases towards the east, where the highest peaks are grouped. 6 peaks rise above 1300 m, and 12 peaks above 1200 m a.s.l.
Vegetation (Jasiewicz 1965; Zarzycki 1963): the arrangement of main forest zones is different from that in the West Carpathians, what is connected with the lack of spruce forests of upper montane forest zone. The foothill forest zone of mixed deciduous forests (*Tilio-Carpinetum*) up to 450—500 m a.s.l., with azonal stands up to 700 m a.s.l. forms only less than 3.5% of the area. The beech forests (*Fagetum carpaticum*) of lower montane forest zone dominating absolutely on the slopes between 450 and 1180 m a.s.l. (ca. 90% of the area), contact directly the mountain meadows covering the tops and ridges, which are, to a high extent the secondary anthropogenic communities. Spruce forests (*Piceetum abietetosum*) scarce nowadays in the area, occupy the valley bottoms and flats up to ca. 800 m a.s.l., with a damp and cool microclimate. The riverside alderwoods (*Alnetum incanae*) accompanying the rivers and streams is one of the richest woodland associations of the area. The contribution of East-Carpathian plants to the flora, conspicuous in the southeastern part (27 species), decrease westwards.
Soils: slightly leached to acid brown soils prevail, podsol and cryptpodsol (deluvial) soils are rare; mud and bog (alluvial) soils occur in the valley bottoms.

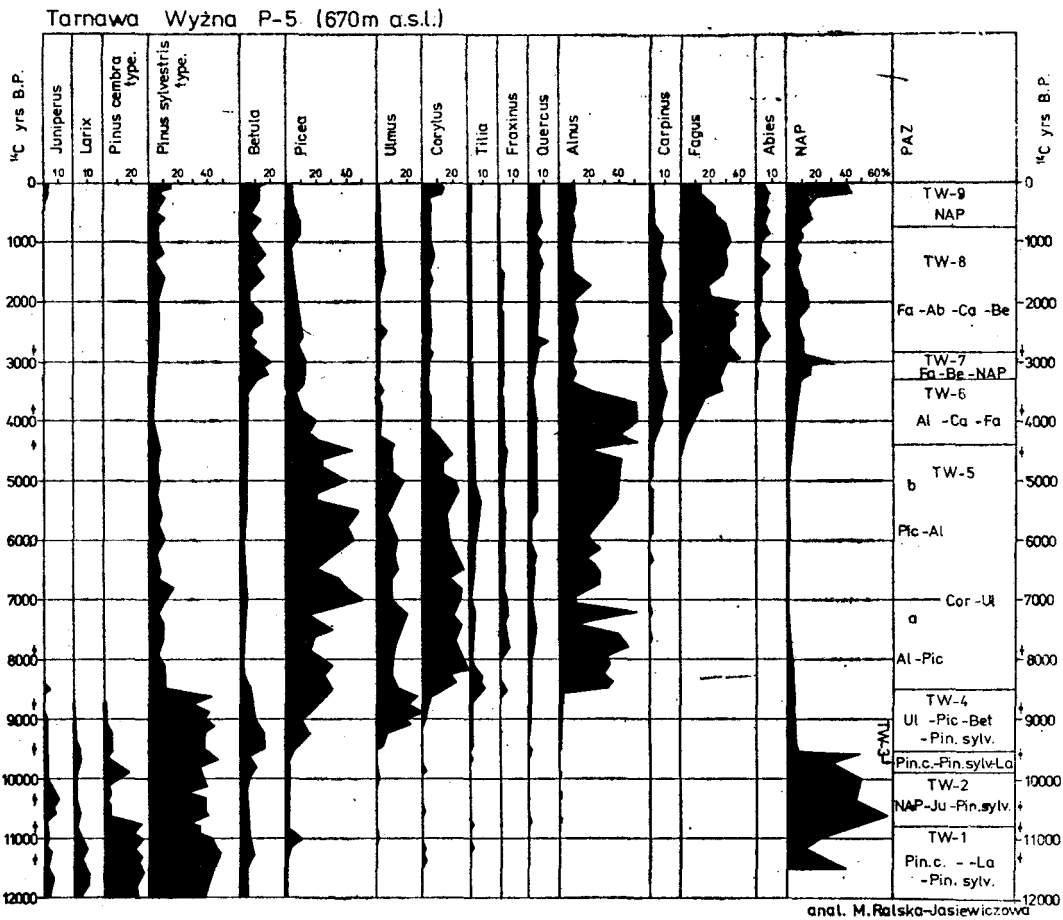

Fig. 1. The simplified pollen diagram from the Tarnawa Wyżna peat-bog

Population: the SE part was totally depopulated after the 2nd World War, the population of 1970's — 20—40 persons/km² in W part, and 20 per/km² in E part is now quickly growing.

Land use: the above concerns also the land use.

There is one reference site and 3 complementary sites studied in the region (Ralska-Jasiewiczowa 1972, 1980).

Reference site P-5: Tarnawa Wyżna (Fig. 1).

Long. 22°50′ E, lat. 49°06′ N, 670 m a.s.l.

Age range: ca. 11800 B.P. — 0 B.P.

A raised-bog, 9 ha, max. sediment depth 7.25 m, on the upper terrace of River San in its uppermost course.

9 regional pollen assemblage zones, 9 ^{14}C dates:

Local zone		Regional zone
TW-1	11800—10800 B.P.	*Pinus cembra-Larix-Pinus sylvestris*
TW-2	10800— 9900 B.P.	NAP (*Artemisia*)-*Juniperus-Pinus sylvestris*
TW-3	9900— 9550 B.P.	*Pinus cembra-Pinus sylvestris-Larix*
TW-4	9550— 8500 B.P.	*Ulmus-Picea-Betula-Pinus sylvestris*

TW-5 8500— 4400 B.P. *Corylus-Ulmus-Picea-Alnus*
a 8500— 7000 B.P.
b 7000— 4400 B.P.
TW-6 4400— 3300 B.P. *Alnus-Carpinus-Fagus*
TW-7 3300— 2850 B.P. *Fagus-Betula*-NAP
TW-8 2850— 750 B.P. *Fagus-Abies-Carpinus-Betula*
TW-9 750— 0 B.P. NAP

Complementary site 2: Smerek.
Long. 22°26′ E, lat. 49°11′ N, 600 m a.s.l.
Age range 0-ca. 9000 B.P.
A degraded raised bog, 2 ha, max. depth 3.70 m, on an alluvial fan formed by 2 streams within the Wetlina river valley.
6 local pollen assemblage zones, 2 ^{14}C dates:

Sm-1 ... — (ca. 8700) B.P. *Ulmus-Pinus-Picea*
Sm-2 (ca. 8700)—4300 B.P. *Corylus-Picea-Tilia-Alnus*
Sm-3 4300—3300 B.P. *Carpinus-Fagus-Picea*
Sm-4 3300—2750 B.P. *Fagus-Carpinus*-NAP
Sm-5 2750—500 B.P. *Fagus-Abies-Carpinus-Betula*
Sm-6 500—0 B.P. NAP-*Betula-Fagus*

DISCUSSION

Regional vegetation:

1. During the Allerød the forests composed of *Pinus cembra*, *P. sylvestris* and *Larix*, with *Picea* present since ca. 11300 B.P., reached probably altitudes of ca. 800—1000 m a.s.l. The open areas were occupied by grasslands and abundant tall herbs with *Alnus viridis*.
2. During the Younger Dryas the forest areas were reduced, but the clusters of trees grew up till at least 700 m a.s.l.
3. The Holocene changes of vegetation were preceded by a regeneration phase of late-glacial conifer forests between ca. 9900 and 9500 B.P.
4. *Picea* and *Ulmus* expanded between 9500 and 8500 B.P., invading pine forests.
5. During the time span between ca. 8500 and 4500 B.P. the composition of forests was rather stable, with *Ulmus* (mountain elm) and *Corylus* dominant on the slopes, and some contribution of other deciduous trees (*Tilia cordata* and *T. platyphyllos*, *Fraxinus*, little *Quercus*) in lower elevations. *Alnus* (both *A. glutinosa* and *A. incana*) and *Picea* occupied valley floors.
6. *Carpinus* and *Fagus* expanded since ca. 4400 B.P. and the formation of modern forest zones started since then. The zonal differentiation of *Carpinus* and *Fagus* communities was initially less distinct than in West Carpathian ranges. Since ca. 3500 B.P. *Fagus* dominated absolutely on the slopes; since ca. 2800 B.P. *Abies* contributed to beech forests, and to spruce forests on the valley floors.

7. The formation of modern forest zones was more or less concluded around 2800 B.P. The mixed deciduous forests with *Carpinus* dominant occupied foothill zone up to ca. 600—700 m a.s.l., being more and more heavily destroyed by human activities. The beech forests with maple (*Acer pseudoplatanus*) and some fir mostly on northern exposures formed lower montane forest zone up to the forest limit at ca. 1200—1250 m a.s.l., where some small groups of spruce besides thickets of *Alnus viridis* might have been present. The treeless rocky crests supported grasslands with colonies of alpine and subalpine plants which persisted probably since the Late Glacial.

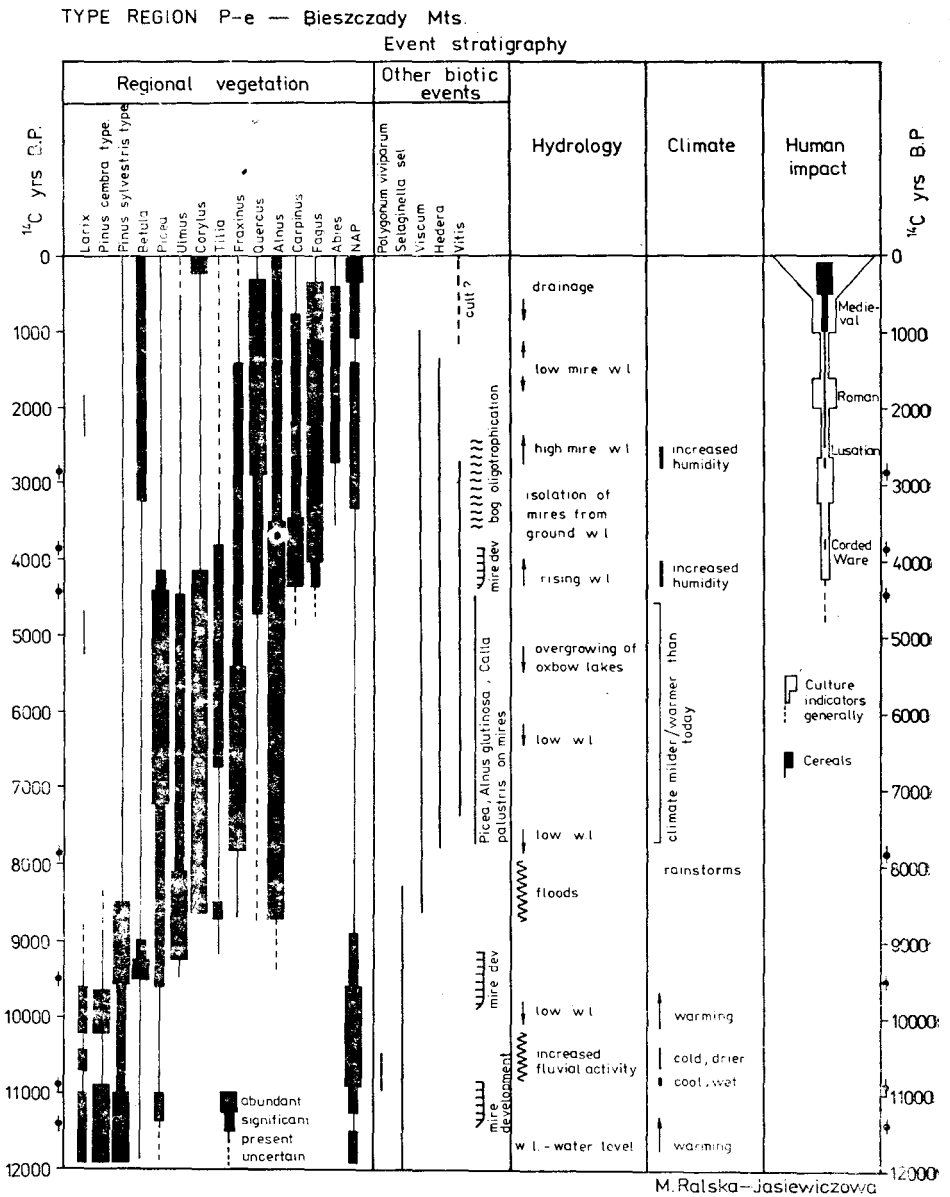

Fig. 2. The event stratigraphy table for the Bieszczady Mts. type region

Hydrology, mire development and climate (Fig. 2):

1. During the late glacial small stagnant pools and eu-mesotrophic mires occurring in the valley floors were periodically overflooded by shallow braided-stream rivers.
2. The older phase of mire development around 9900 B.P. was connected with the subsiding of hydrological processes.
3. The flooding of mires on river terraces is indicative of a period of increased precipitation between ca. 8500 and 8000 B.P.

4. The expansion of trees on minerotrophic mires indicate drier conditions between 8000 and ca. 4500 B.P.
5. The development of a younger generation of mires between 4500 and 4000 B.P. and the coincident inundation of old forest mires point to a period of increased humidity at that time.
6. The progressive isolation of mires from the ground water table and the formation of raised bogs evidences high mire water levels between 3600 and 3000 B.P.
7. The changes of vegetation suggest a more continental climate during the early part of Allerød, and a milder climate during its younger phase.
8. The Younger Dryas was generally cool with a minimum of humidity in its final phase.
9. The climate of Preboreal was warmer, but continental in its older part and milder and more humid in the younger part.
10. The presence of typically lowland species on mires (*Alnus glutinosa*, *Calla palustris*, *Carex elongata*, *C. pseudocyperus*, *C. pendula*) as well as in the deciduous forests (*Tilia cordata*, *Rhamnus cathartica*, *Viscum*, *Hedera helix*, *Vitis sylvestris*) is indicative of a climate warmer, milder and less continental than today, starting since ca. 8500 (8700) B.P. till at least 4500 B.P.

Human impact:

1. The earliest pollen evidence of human activites at ca. 4400 (4300) B.P., indicate presence of Late Neolithic, probably Corded Ware tribes practicing mostly cattle breeding.
2. The settlement intensified about 3200 (3000) B.P., in connection with the expansion of Lusatian Late Bronze culture depending mostly on animal husbandry and pasturing. Its impact lasted about 700 yrs. The clearings were located primarily in low-lying mixed deciduous forests, but later were extended upwards the slopes within beech forests. The cereal cultivation started also then.
3. The renewed activation of human impact during the period of Roman influences was connected with the development of trade routes through the mountain passes, and location of settlements along them.
4. The large-scale forest destruction and the development of permanently grazed meadows and secondary forests occurred during the early medieval and medieval colonization, after 1000 B.P.

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