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TYPE REGION P-a: INNER WEST CARPATHIANS — NOWY TARG BASIN

The region of the Inner Western Carpathians (P-a) consists of the Tatras and Podhale. The Tatras are the highest mountain range in the Carpathians, while Podhale is a subsidence depression between the Tatras to the south and the Outer Carpathians to the north. Since the type locality and other peatbogs studied (Obidowicz, in press) are situated in Podhale, the following information concerns this part of the region P-a. Only the description of the vegetation cover refers to the whole region.

Altitude: ca. 600—ca. 1200 m a.s.l.

Climate: January mean temperatures -10.5 — -3.0°C , July mean temperatures 11.5 — 14.5°C ; total annual rainfall 700—above 1100 mm; westerly winds prevailing. Geology: Tertiary sandstones and flysch shales underlying a system of Pleistocene fluvioglacial gravel covers.

Soils: brown soils, podzols, initial rendzinas, pseudogley, warps.

Vegetation: foothill zone, up to 550—600 m a.s.l. — *Tilio-Carpinetum* and *Pino-Quercetum*; lower montane forest zone (to 1250 m a.s.l.) — *Abieti-Piceetum montanum*, *Galio-Piceetum carpaticum*, *Luzulo nemorose-Fagetum*, *Dentario glandulosae-Fagetum* and *Alnetum incanae* in dependence on the substratum; upper montane forest zone (1200 ± 150 m a.s.l.), of which spruce forests are characteristic, *Poly-sticho-Piceetum* on a calcareous substratum, and *Plagiothecio-Piceetum tatricum* on flysch or granite.

Subfield associations of the classes *Elyno-Seslerietea* and *Caricetea curvulae* occur from the subalpine to the subnival zones. *Pinetum mughi carpaticum* is the characteristic brushwood association of the subalpine zone (1530—1850 m a.s.l.). A number of associations of the class *Betulo-Adenostyletea* also grow in this zone. Population: population density in Podhale approximates 70 persons/km².

The beginnings of settlement fall in Late Neolithic, it increases in intensity in the Bronze Age to flourish starting from the mid-thirteenth century. At the turn of the fourteenth century it undergoes a transient deep regress.

Land use: arable land — 45%, meadows and pastures — above 30%, forests — above 20%.

Puścizna Rękowiańska (19°49'E and 49°29'N) is a mountain raised bog, about 280 ha in area. Deep ditches, draining its marginal part, have brought about the dominance of secondary communities of dwarf shrubs. The associations *Sphagnetum magellanici* and *Scheuchzerio-Sphagnetum cuspidati* and a community with *Sphagnum papillosum* grow in the central part of the bog, where the water table is high. The history of the latest 10 000 years is recorded in a continuous manner in the peat deposits and the underlying layer of clay. The fragment of the Late Glacial presented

Puścizna Rękowańska P-1 (656m a.s.l.)

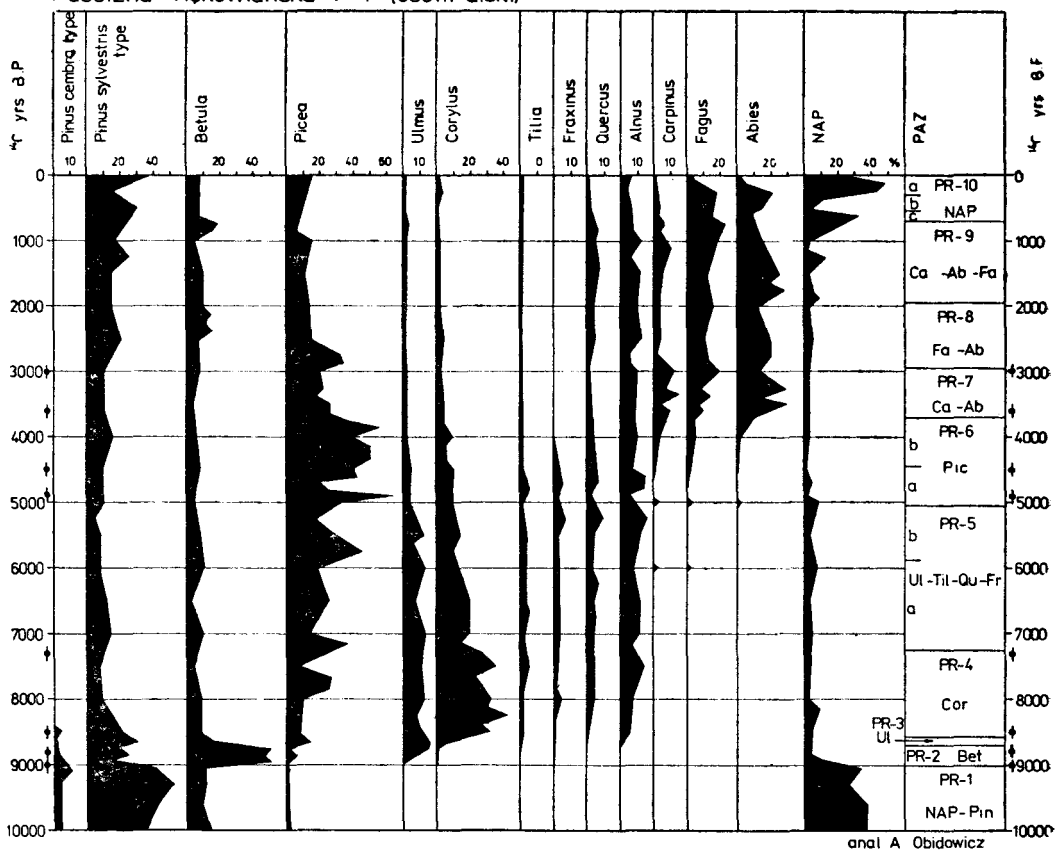


Fig. 1

in Fig. 2 has been worked out on the basis of Koperowa's (1962) work. The following pollen assemblage zones have been distinguished (Fig. 1):

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|--|-----------------------------|
| PR-1 NAP-Pinus PAZ | ca. 10000—8960±80 B.P. |
| PR-2 <i>Betula</i> PAZ | 8960±80—8800±160 B.P. |
| PR-3 <i>Ulmus</i> PAZ | 8800±160—8570±90 B.P. |
| PR-4 <i>Corylus</i> PAZ | 8570±90—7350±160 B.P. |
| PR-5 <i>Ulmus-Tilia-Quercus-Fraxinus</i> PAZ | 7350±160—ca.5000 B.P. |
| PR-5a LPZ | 7350±160—ca. 6000 B.P. |
| PR-5b LPZ | ca. 6000—ca. 5000 B.P. |
| PR-6 <i>Picea</i> PAZ | ca. 5000—3670±70 B.P. |
| PR-6a LPZ | ca. 5000—4540±150 B.P. |
| PR-6b LPZ | 4540±150—3670±70 B.P. |
| PR-7 <i>Carpinus-Abies</i> PAZ | 3670±70—3030±60 B.P. |
| PR-8 <i>Fagus-Abies</i> PAZ | 3030±60—ca. 1950 B.P. |
| PR-9 <i>Carpinus-Abies-Fagus</i> PAZ | ca. 1950 B.P.-ca. A.D. 1234 |
| PR-10 NAP PAZ | ca. A.D. 1234-ca. 1980. |
| PR-10a LPZ | |
| PR-10b LPZ | |
| PR-10c LPZ | |

TYPE REGION P-a — Inner West Carpathians — Nowy Targ Basin
Event stratigraphy

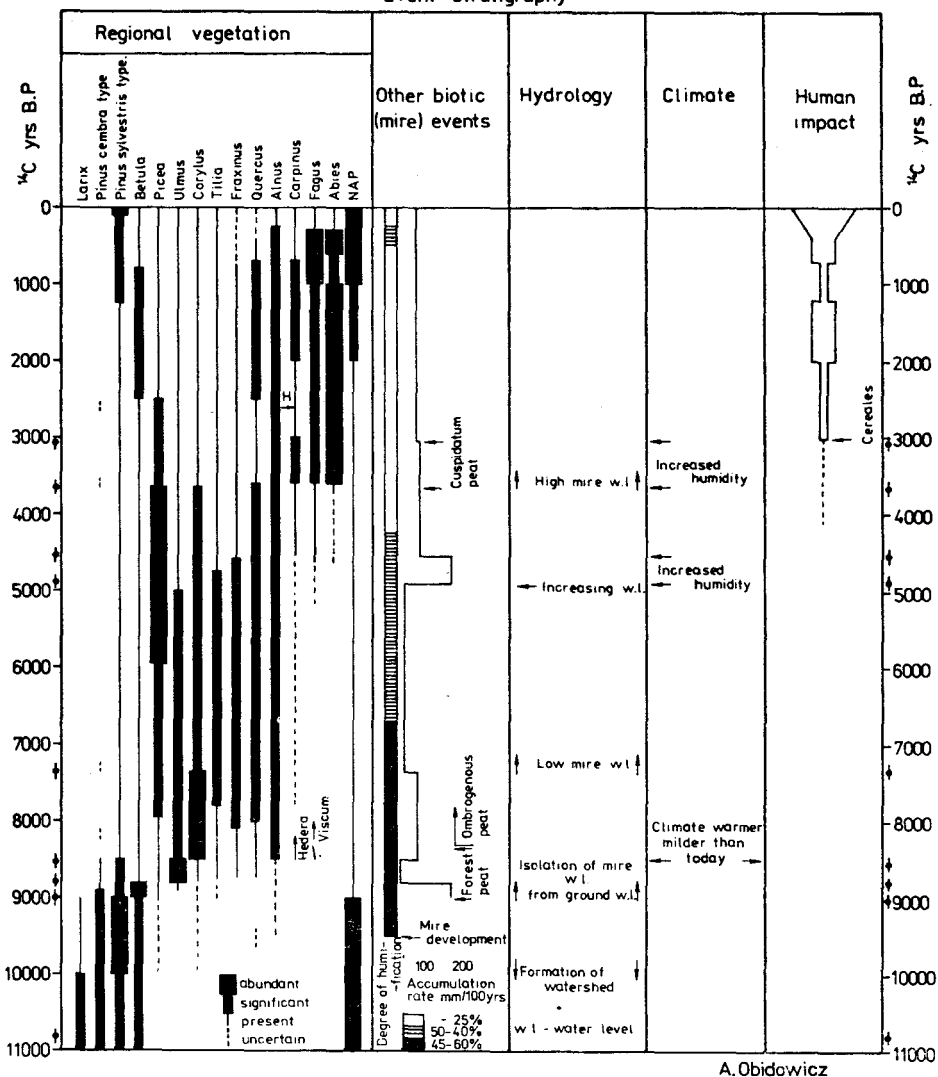


Fig. 2

DISCUSSION

The beginnings of bog formation in Podhale date back to the Allerød, when, acc. to Koperowa (1962), pine-spruce forests with birch, alder and fir were dominant. That first stage of biogenic deposit accumulation was interrupted owing to a progressive change in the watershed and a wide overflow of river waters. The Younger Dryas, at least its decline, represented at the bottom of Puścizna Rękowańska, was a period of the forest-tundra vegetation, which, at the beginning of

the Holocene, gradually turned into pine and stone pine forests with an admixture of larch. Since 9200—9000 B. P. the area of forests increased and the deposits of Puścizna Rękowańska began to accumulate. Peat layers containing 60—80% of sedge remains with some contribution of *Equisetum limosum* and *Phragmites communis* were deposited, and peat comprising up to 90% remains of *Drepanocladus* sp. accumulated locally.

Starting from ca. 9000 B.P., the forests became denser, which is confirmed by the high concentration of AP. Birch and birch-pine swamp forests, with abundant ferns and a high proportion of *Filipendula*, dominated then. The areas of peat accumulation are characterized by the mass occurrence of *Betula nana*, documented both in the pollen profile and by macrofossils.

Immediately after the retreat of birch forests *Ulmus* became a dominant element for a short time, *Acer* and *Corylus* appeared in Podhale, and *Picea* began to expand. A gradual warming of the climate without any significant changes in the total annual rainfall brought about a marked decrease in the rate of peat accumulation (Fig. 2).

The phase of *Corylus* dominance started about 8570 ± 90 B.P. On south-facing slopes the hazel found suitable conditions to form communities related to the association *Lonicero-Coryletum*, now associated with shallow and stony soils. It also contributed to the riparian forests of *Fraxino-Ulmetum* type. However more common in the river valleys of Middle Podhale were forest communities of *Alnetum incanae* type. During the hazel phase *Quercus* and *Tilia* appeared in Podhale and so did sporadically *Taxus*, what is its earliest Holocene appearance in the Western Carpathians. The climate was warm and not very dry, with warm summers and mild winters (*Hedera*, *Viscum*). At about 8300 B.P. the accumulation of minerogenic peats came to an end in a considerable part of Puścizna Rękowańska mire, ombrogenic peat started to grow, its accumulation rate being 90 mm/100 years. An *Eriophorum vaginatum* dominated community appeared at that time.

The phase of dominant deciduous forests and the optimum development of carrs, surely comparable with the present-day communities *Fraxino-Ulmetum* or *Carici remotae-Fraxinetum* began about 7350 ± 160 B.P. In the eastern part of Podhale alderwoods of the *Alnetum incanae* type were still fairly common. The south-facing slopes provided good conditions for *Asperulo-Tilietum*-type forests. Spruce began to expand intensely about 6000 years ago.

Since ca. 7350 ± 160 B.P. different peat types dominated by the ombrotrophic species of *Sphagnum* began to accumulate. Their accumulation took place nearly all over the whole peatbog surface, but its rate is half lower than during the previous phase. The water table in the peatbog was relatively low during the growing season, what resulted in the decrease in the accumulation rate and in the intense humification persisting till ca. 6700 B.P. Later on in this phase intensity of peat decomposition decreased.

Around 5000 B.P. the area occupied by carrs shrank and the spruce forests expanded; from 4540 ± 150 B.P. they would dominate absolutely. About 5000 B.P. a rapid rise in the rate of peat accumulation occurred, without any noteworthy changes in the composition of peat-forming communities. This is undoubtedly an indication of oncreasing humidity connected with a cooling. A progressive transgression of ombrogenic peat beyond the initial area of the accumulation basins can be observed in this phase in Podhale peatbogs. After 4540 ± 150 B.P. the accumulation rate decreased again. At the decline of *Picea* PAZ *Betula nana* disappeared from Podhale. Swamp pine forests of the *Eriophoro vaginati-Pinetum* or *Pino-rotundatae-Sphagnetum* type developed on some peatbogs as early as then.

During the period between 3670 ± 70 and 3030 ± 60 B.P. all the forest communi-

ties corresponding to the recent communities of the Western Carpathians were formed. The vertical zonal system resembling the present-day pattern developed as well. Later transformations were mainly of quantitative nature. The proportion of *Ericaceae* remains decreased very distinctly in the peat deposit and the degree of peat decomposition decreased. In the other peatbogs examined the type of peat changed into that forming with a high water table. An essential change of climate connected with the increase of precipitation during the growing season took place at that time.

During the remaining 3000 years hummock peat, and especially its variety with *Sphagnum magellanicum*, was deposited in all the peatbogs examined. This may indicate the stabilization of climate, particularly its humidity.

The first changes in the pollen diagram which maybe connected with the episodic presence of pastoral groups of Neolithic tribes are dated at ca. 4100 B.P. interpolated date. The presence of man from 3030 ± 60 B.P. onwards, is confirmed by the continuous curve of cereals and the increasing proportion of apophytes and anthropophytes pollen. Since 1234 the settlement in Podhale has been documented by historical records. The beginning of peat winning puts an end to its growth. The disturbed hydrological system favours the expansion of *Pinus* and the development of the association *Pino rotundatae-Sphagnetum*, and in many peatbogs also of a community with *Sphagnum capillifolium*.

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