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# MACROSCOPIC REMAINS OF THE DWARF MISTLETOE *ARCEUTHOBIUM* BIEB. (*LORANTHACEAE*) IN THE NEOGENE OF POLAND

PRELIMINARY REPORT

Szczątki makroskopowe karłowatej jemioły — *Arceuthobium* Bieb. (*Loranthaceae*) w neogenie Polski

Doniesienie tymczasowe

ABSTRACT. A large number of very well preserved macroscopic remains of the genus *Arceuthobium* (male and female specimens, fruits) have been found in the Upper Miocene flora of Gozdnica in Lower Silesia. In the fossil state the genus *Arceuthobium* has hitherto been known from pollen grains, particularly often encountered in Miocene deposits.

## INTRODUCTION

The species of the genus *Arceuthobium* (dwarf mistletoe) are parasites growing exclusively on coniferous trees. Now 32 species and 6 subspecies are known within this genus, most of them occurring in North and Central America, one species in Europe and three in south-eastern Asia.

In the fossil state this genus has hitherto been known exclusively from pollen grains, which occur in deposits varying in age, starting from the Eocene (*Spiculaepollis arceuthobioides* Krutzsch), and particularly frequently in Miocene profiles (Krutzsch 1962). In Poland they have been met with in the Miocene of Rypin (Stuchlik 1964; he distinguishes two forms, of which the smaller corresponds to the pollen grains of *Arceuthobium oxycedri* M.B.) and further in some dozen Upper Miocene profiles in Silesia (Sadowska 1977), in the Miocene of Koniówka in the Nowy Targ-Orava Basin (Oszast & Stuchlik 1977) and Stara Wieś near Wilamowice (Oszast 1980).

No macroscopic fossil remains of *Arceuthobium* have hitherto been known; nevertheless, the possibility of their occurrence in the flora of Baltic ambers

has been taken into consideration. Two species of the extinct genus *Patzea*, described by Conventz in 1886 (cf. Schenk & Schimper 1890), were referred by some authors to *Arceuthobium* (Czeczott 1961; Němejc 1975). However, a close analysis of the morphology of *Patzea johniana* Conv. and *P. mengeana* Conv. does not support this opinion.

In 1976 I found numerous macroscopic remains of *Arceuthobium* (male and female specimens, fruits) in the perfect state of preservation in the Upper Miocene flora of Gozdnica in Lower Silesia (Stachurska *et al.* 1971). This interesting and abundant fossil material (about 380 specimens) is worthy of comprehensive study.

## MORPHOLOGY

The species of the genus *Arceuthobium* are for the most part plants of small size, they reach scarcely several centimetres in height. They overgrow the branches of their host densely, chiefly trees of the family *Pinaceae*, especially various species of *Pinus*. *Arceuthobium* has segmental, smooth and shiny shoots with opposite leaves reduced to pairs of coalesced scales. In the axils of leaves there are dioecious flowers. Their perianth is in one whorl. The male flower has a 3- or 4-parted perianth, 2·0–3·0 mm in diameter (in open flowers). Each part of the perianth bears a sessile stamen, with a large one-chambered anther, opening along a circular slit. The 2-parted female flowers, 1·0–2·0 mm high, have a short carpel with blunt stigmata and a short pedicel. The fruit is a flattened oval berry on a short pedicel. Ripe fruits burst explosively and their single seeds are ejected for a marked distance, which causes a quick spread of these parasites (Hawksworth 1978).

## FOSSIL MATERIAL

Various developmental stages of male and female plants are represented in the material from Gozdnica. The fossil material is not only abundant and perfectly well preserved but also differentiated. Shoots with staminate flowers, detached staminate flowers, open and closed, and single parts of perianths with anthers occur in the material, as regards male specimens. The female specimens include shoots with pistillate flowers, groups of pistillate flowers at the top of shoots, detached pistillate flowers, and fruits at various stages of maturity. Both male and female parasitic plants at the initial stage of growth of the aerial part on host twigs have also been encountered (these remains are about 1·5 mm in diameter).

**Shoots.** Particular segments of shoots are nearly all very small, 1·0–2·2 mm long and 1·0–1·3 mm wide, measured at the level of the arcuately bent tops of scale-likeleaves. The biggest of the shoot segments preserved is above 3·0 mm long and 1·5 mm wide.

**Male flowers.** The perianth is 3- or 4-parted; the 4-parted specimens occur frequently, perhaps even more frequently than the 3-parted ones. These last have segments relatively broader and blunter at the top. The open flowers are about 1·5 mm in diameter, but they may have been somewhat larger. It is hard exactly to determine the diameter of these flowers, as they are mostly closed or only partly opened. Particular parts of perianth are about 0·8–1·0 mm in length and 0·4–0·65 mm in width. On the internal side of each part there is a flat round anther, 0·3–0·4 mm in diameter. The external surface of the perianth is glossy, with well seen rows of isodiametrical cells.

**Female flowers.** The perianth is 2-parted, relatively shallowly indented, the carpel is short and bluntly ended, the pedicel short. The flowers are 0·5–1·2 mm long and 0·4–0·9 mm wide, according to their developmental stage. The structure and symmetrical arrangement of flowers at the top ends of shoots are particularly well seen.

**Fruits.** The flattened, oval or elliptic-oval fruits are 1·4–2·4 mm long and 0·6–1·2 mm wide. Two separate parts are distinctly marked in them. The upper part is built of the preserved female perianth, usually wrinkled and covered with longitudinal and irregular, deep folds. The lower part of marked thickness, holding a seed inside, has its external surface finely and densely ribbed, which gives it a characteristic appearance. The upper part of the pedicel persists in some fruits. A few specimens were infested by fungi, whose fruit-bodies (round, black perithecia) occur sometimes in a large number on the surface of the fruits.

At first sight the remains from Gozdnica show much resemblance in morphology to the European species *Arceuthobium oxycedri* M.B., which lives on *Juniperus oxycedrus* L. However, there is a distinct difference in the structure of staminate flowers, which in this species are as a rule 3-parted, while the 4-parted ones occur quite exceptionally. The determination of the relationship between the Miocene remains and the modern species, possible after a close analysis of comparative materials, will be the subject of a separate study. A half of the now living species, i.e. 13 North-American species, 2-East-Asiatic and 1 European, have been investigated so far.

Acknowledgements

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# PLATES

## Plate I

Genus *Arceuthobium* from the Miocene of Gozdnica, × 20

1, 2. Segments of shoots

3–12. Male specimens:

3, 4. Staminate flowers, 4-parted, at the top of shoots

5–9. Staminate flowers, 4- and 3-parted, in different positions on the terminal segment of a shoot

10, 11. The internal side of a flower part with the anther preserved

12. The external side of a flower part

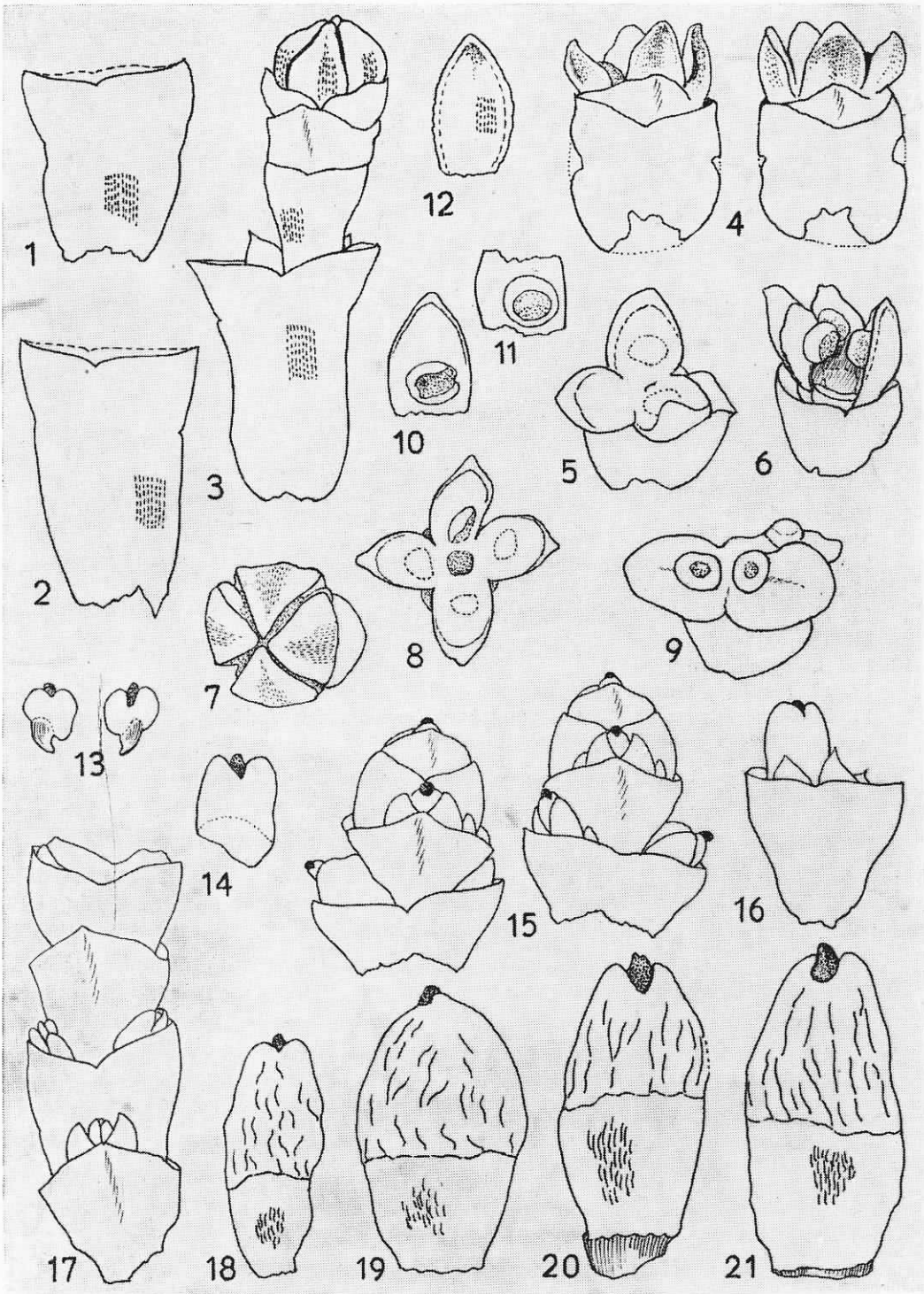
13–17. Female specimens:

13, 14. Pistillate flowers

15. Pistillate flowers at the top of a shoot (seen from two sides)

16, 17. Shoot segments with pistillate flowers

18–21. Fruits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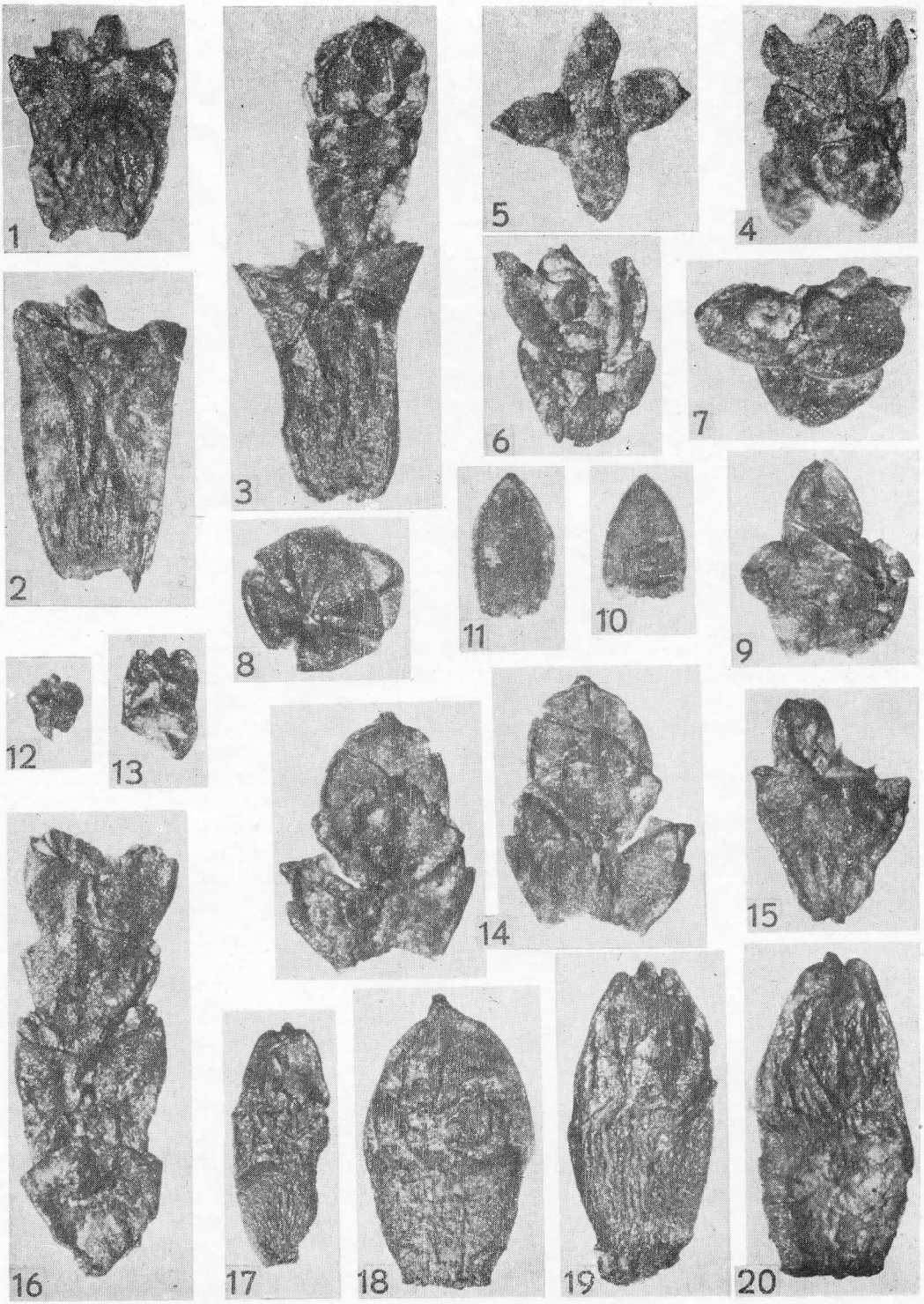
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