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The yew (*Taxus baccata* L.) of the Cisowy Jar reserve near Olecko

Abstract: The present paper describes the current situation of *Taxus baccata* L. in the Cisowy Jar Reserve: number, their state of health, height and diameter structure, and the sex ratio. In the result only 25 yews were found. Their state of health was relatively good, but many yews that grew on very heavily shaded stands were characterized by little height accretion and greater leaf reduction than those growing on more sunny positions. There is no continuity of population. No specimens in the height range between 51–100 cm were found. Sparse seedlings die in first years after appearing. Active human help is necessary to protect and to reconstruct the yew population in the reserve.

Additional key words: nature reserve protection, growth, sex ratio, shade

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Introduction

Taxus baccata L. is a protected species in Poland. In natural state it occurs on few localities. Very often the stands consist of a small number or even of single individuals (Browicz and Gostyńska-Jakuszewska 1969). Slow growth, diocey, occurrence in the understorey forest stands or in the undergrowth and first of all the use of valuable timber in the past, have caused the reduction of yew in Poland. As the Warta Statute of 1423 shows, the problem of the extensive exploitation of this species was recognized, as by this regulation king Władysław Jagiełło imposed severe penalties for cutting yew trees in the forest (Kontny 1937; Czartoryski 1975a, 1975b).

Taxus baccata is a still disappearing species in spite of its protection. Reserve Cisowy Jar is an example of a stand, where the number of yew specimen has decreased considerably. The natural stand in the reserve with most yew trees was cut down about the year 1912, when the area of today's reserve was handed over to the Berlin's National Bank. The stand must have been very large indeed, as the number of yews that survived this action was still the largest in Eastern Prussia (Steffen 1931; Kobendza 1949 after Schöenichen 1926). However, they were exposed to very unfavorable conditions in the open area when the stand ceased to exist (Kobendza 1949). Additionally, many yew trees were being destroyed and dug out, because local people believed, that yew twigs bring good luck and have magic power (Steffen 1931). It brought drastic decrease in the number of the population.

The objective of the present study was to determine the current state of yew population in the reserve. The condition of particular specimens, the height and diameter structure of the population and sex ratio were analyzed.

Materials and methods

In terms of physiographic characteristic, the Cisowy Jar reserve is situated in geographical macroregion of the Pojezierze Mazurskie and mezoregion of Wzgórza Szeskie (Kondracki 1998) (Fig. 1). The reserve is localized on the grounds of Olecko Forest Department. The reserve constitutes the farthest stand

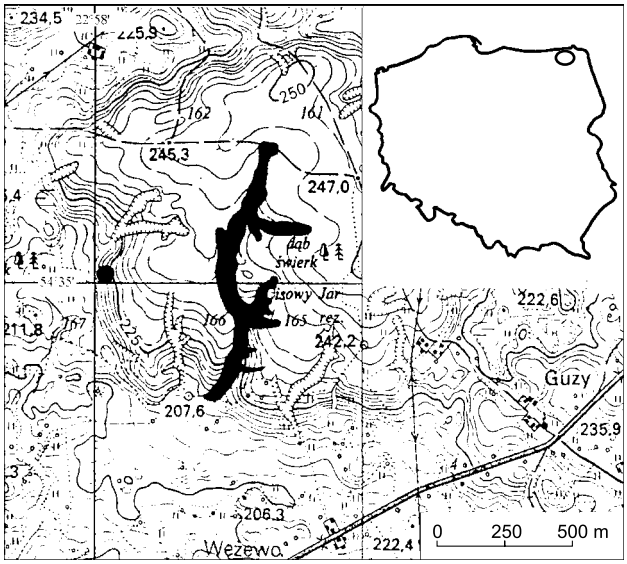

Fig. 1. Location of Cisowy Jar Reserve and single yew tree

of this species to the north-eastern direction of Poland, near the eastern range limit (Browicz and Gostyńska-Jakuszewska 1969). The area of Wzgórza Szeskie is characterized by relatively humid climate (with annual rainfall often exceeding 700 mm) and colder than neighboring regions (from 0.5 to 1°C) (Kondracki 1998). On the other hand, large accumulation of species Bryophyta of the euroatlantic element indicates, that the microclimate in the Cisowy Jar reserve is milder (Jasnowski 1958). The reserve area comprises a gorge about 1000 m long and up to 30 m deep, and adjacent surroundings. The slopes of the gorge are very steep and their inclination sometimes reaches 35°.

The dominant plant is dry-ground forest: Jutrzenka-Trzebiatowski (1995) classified it as slope maple-linden forest (*Aceri-Tilietum typicum*). However, Sokołowski (1970) earlier distinguished it as subassocciaton *Tilio-Carpinetum fissidentosum taxifoliae*. Apart from yew, the peculiarity of the reserve flora is the great number of orchid species, especially *Orchis mascula* ssp *mascula* (Zyskowski and Szlachetko 1992). The most common soils are leached brown soils, made up of hardly permeable clays and clay loams components, having, with reaction in the upper layers, neutral and slight acidic reaction – pH_{KCL} 4.7–6.7 (Majer et al. 1983).

In the field study (May 2000), the number of yew specimens and their distribution in the reserve was determined. The height of each specimen, crowns breadth in the two directions, the breast height diameters, and the sex and the state of health was determined for each specimen. Measurements of tree height were taken with a section gauge, a height pole and a measuring tape. The sex of all yew trees was determined by observation of presence of macro- and microstrobils in the early spring (May). The remains of seeds were also helpful for determining female specimens. The state of health was described by means of three-degree scale:

– healthy specimens – without visual damage symptoms,
– specimens with reduced number of leaves and shortened length of sprout,
– dying specimens.

Results

In the result of the study, 25 individual yew specimens were found in the reserve, six of which did not exceed 50 cm in height. Only two yews had a shrubby form, all other specimens were of arborescent form. Two arborescent ones were fallen down, but in spite of that, they had many offshoots growing up from the lying trunk (Fig. 2). The height of the yews ranged from 15 to 630 cm, and the average height was 302.8 cm. The average breast height diameter was 6.44 cm, with the maximal one of 17 cm, but seven specimens did not attain height of 1.3 m. The average crown breadth measured in the two directions was 333.29 cm and it ranged between 20 and 560 cm.

In case of the 16 specimens the sex was determined. On the other specimens, generally younger, no features enabling sex classification were observed. The sex ratio was exactly 1:1, and only in one case it was impossible to determine sex of a specimen over 200 cm high. The state of health of the yews was good and only one tree had a significantly reduced crown. Nevertheless, many yews grew in very deep shadow cast by *Picea abies* Karst. and the undergrowth composed of *Carpinus betulus* L., *Corylus avellana* L., *Tilia cordata* Mill. and *Populus tremula* L. Yew growing in such conditions is characterized by small annual growth and by greater leaves reduction (Fig. 3) than on positions that get more sunlight. The shortage of light could be a reason of lack of seedlings. Only 2 biennial seedlings were found in the reserve. On the whole area of the reserve there were also many dead yews in the advanced stage of decomposition. All of them had a shrubby form.

Apart from yews in the Reserve itself, there is an impressive yew tree growing about 500 m away to the West (Fig. 1). It is a tree-like specimen 720 cm high, with the breast height diameter of 33 cm and the average crown breadth of 820 cm. It pollinated very heavily in 2000.

Discussion

When comparing the numbers of yews counted on the reserve area in various years (Fig. 4) it can be observed, that it increased rapidly in 1965 (1392 specimens), as compared with 1949 (50 specimens) and

Fig. 2. Yew tree fallen down, having many offshoots growing up from the lying trunk

decreased drastically in 1973 (17 specimens). The decrease in number of the yew population was probably most influenced by a change in the environmental conditions that resulted from the removal of the woodland stand and to the artificial regeneration of spruce. High number of yews in 1965 was probably a result of the mass appearance of the natural regeneration, as well as of the differences in the methods of surveying (in 1949 and in 1973 single specimens below 50 cm in height were not included in the surveys). Unfortunately, at present seedlings occur sporadically. It is also intriguing that there are no yews between 51–100 cm high and that the number of yews shifts from the lower height ranges to the higher ones in subsequent surveys (Fig. 5). This shows the lack of success in the propagation. The seedlings die probably in the first years after appearing. A similar process is observed in the best-known yew reserve in Poland, the Cisy Staropolskie Leon Wyczółkowski reserve in Wierzchlas in Bory Tucholskie and in other places in Poland and in Europe (Paczoski 1928; Gieruszyński 1961; Kościelny and Król 1970; Król 1975; Stypiński et al. 1984; Boratyński et al. 1997). However, the number of *Taxus baccata* L. in the Cisowy Jar did not fluctuate much from the year 1973. In spite of that, as compared with the year 1983 the number of yews decreased by 4 specimens, including 2 specimens over 0.5 m (Fig. 5). The process may be

Fig. 3. Yew tree growing in very deep shadow. Visible small annual growth

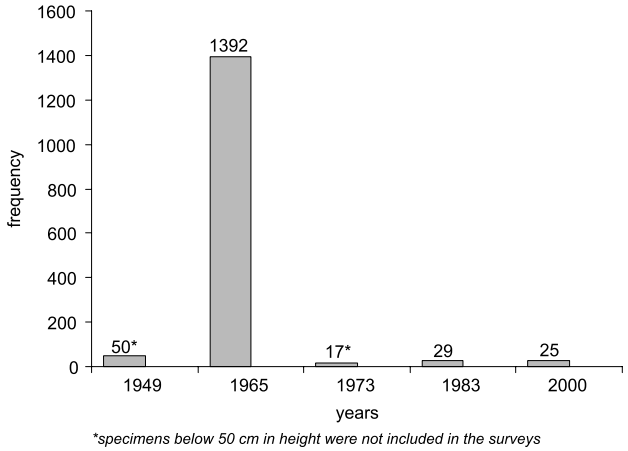

Fig. 4. Number of yews in the years of surveys in Cisowy Jar reserve. Data in 1949 quoted after Kobendza (1949); 1965 after Jasnowski (1970); 1973 and 1983 after Majer et al. (1984)

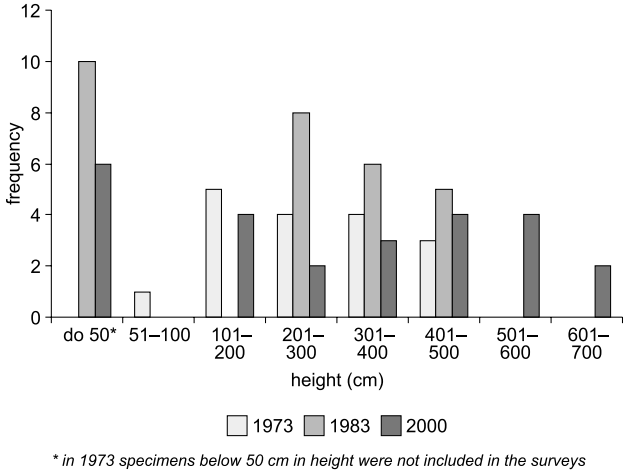

Fig. 5. The height classes distribution in Cisowy Jar reserve. Data in 1973 and 1983 quoted after Majer et al. (1984)

due to the considerable shading of the forest floor. Although the yew is a species usually growing under a canopy, the research showed that it does not tolerate well the extensive and long-lasting shading (Kościelny and Król 1970; Kopp 1991; Kopp and Chung 1997; Giertych 2000).

No traces of damage done by animals were noticed, but there are records that in the past the growth of yews was hindered as a result of browsing by deer (Jasnowski 1970). A study has also been conducted on the adverse influence of animals, which browsed uproot young yews, thus eliminating them or greatly hindering their development (Ostrowski 1968; Find'o and Štefančik 1988; Hulme 1996; Saniga 2000). Although the number of yews is not very high, 16 specimens had macro- and microstrobilus and the remains of seeds, and 8 of them were female. As the yew is a very variable species (Bugała 1975; Seneta 1987; Seneta and Dolatowski 1997; Lewandowski et al. 1995) and cases of upbuilding very large population from single specimens are known (Król 1986) an attempt should be undertaken to reconstruct the population of yews in the Reserve.

Conclusions

1. The number of yews in the Reserve is low (25 individuals) and decreased by 4 specimens as compared to the year 1983.
2. The state of health of yews is good, however, on much shaded stands yew's annual growth decreases and number of leaves is reduced.
3. There is no continuity of the population. No specimens in the height range of 51–100 cm were observed. Probably many seedlings die in the first years after appearing.
4. Presumably the restoration of yew population is possible, because 8 female and 8 male specimens were found. Unfortunately, however, taking into consideration the low number of seedlings, the process seems improbable without active human help.

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