

AREA DISTRIBUTION DYNAMICS OF *CASTANEA SATIVA* FORESTS ON THE NORTHERN SLOPES OF BELASITSA MOUNTAIN

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Abstract

In order to study the temporal dynamics of the area covered by sweet chestnut forests on the northern slopes of Bulgarian part of Belasitsa mountain, a field verification of the first detailed forest inventory (since 1964) was performed. All chestnut co-dominated and dominated forests (CCDF) were grouped into two categories (i) chestnut co-dominated forests (CCF) where chestnut basal area represented 5.5% to 55.5% of the total basal area and (ii) chestnut dominated forests (CDF) with chestnut basal area from 55.5% to 100% of the total basal area. CCDF have lost nearly 13% of their initial area during the studied period (from 1923 ha in 1964 to 1678 ha in 2009). CCF have increased their area from 604 ha to 1030 ha while the area of CDF has decreased from 1319 ha to 648 ha. Therefore, chestnut has lost its dominating role in a half of the initial area of 1319 ha where it used to be a dominant tree species 45 years ago and has become a co-dominant species. The distribution peak of CCDF have shifted with 100 m upwards (from 500 a. s. l. in 1964 to 600 m a.s.l. in 2009), CDF tending to decrease their area regardless the altitude.

Key words: *Castanea sativa*, Belasitsa Mountain, area distribution dynamics

INTRODUCTION

Due to progressive degradation of sweet chestnut (*Castanea sativa* L.) forests in Europe and in the Balkan peninsula in particular (Cabannes, Rolland 1982; Bacchetta, 1984; Bratanova-Doncheva, Mihaylov, 1995; Amorini et al., 2000; Amorini et al., 2000; Petkov, Rossnev 2000), ensuring ecologically coherent network of territories which preserve the species in favourable conservation conditions across its natural range has long been recognized. In Bulgaria, the habitat of European conservation concern 'Forests of *Castanea sativa*' (Directive 92/43/EEC) comprises stands with total area of 3315 ha (Peev, 2008). Altogether 2560 ha have been included in six NATURA 2000 protected zones: Belasitsa; Kresna-Ilindentsi; Osogovska planina; Sreden Pirin – Alibotush; Zapadna Stara Planina and Predbalkan, and Ograzhden-Maleshevo. Belasitsa protected zone incorporates 2085 ha out of 2560 ha totally protected, thus enhancing the habitat favourable conservation status in the site, is of primary importance for its conservation on the country's scale.

Favourable conservation status of a habitat as defined by Directive 92/43/EEC, Article 1 occurs when: (i) its natural range and areas it covers within that range are stable

or increasing; (ii) the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and (iii) the conservation status of its typical species is favourable. In this context, the area of distribution dynamics is an important parameter to be considered when defining the conservation value of a species' population.

Dynamics of sweet chestnut forests is quick (Le Houerou, 1992; Conedera et al., 1998). In absence of management chestnut forests tend to turn into mixed deciduous ones, especially in areas outside the chestnut ecological optimum (Horvat et al., 1974, Konstantinidis et al., 2008). On the northern slopes of Belasitsa mountain, Mihaylov et al. (2007) and Trajkov et al. (2007) ascertain the predominance of other deciduous species in the regeneration stratum of stands where chestnut forms mixtures with European beech (*Fagus sylvatica* L.), sessile oaks (*Quercus* sp.), limes (*Tilia* sp.), hornbeam (*Carpinus betulus* L.) and flowering ash (*Fraxinus ornus* L.), and assume a reduction of sweet chestnut dominated forests in the mountain in continuation of the current trends in their use and management.

The objective of the current investigation was to evaluate the temporal dynamics (for the period 1964-2009) of the area covered by sweet chestnut forests on the northern slopes of Bulgarian part of Belasitsa Mountain as a basis for future research to determine the state and prospects of these forests.

MATERIALS AND METHODS

In order to study the temporal dynamics of the area covered by sweet chestnut forests in studied region, a field verification of the first detailed forest inventory published in the management plan of Pertich State Forest Enterprise in 1964 was performed. Verification was conducted on stand scale basis, all natural stands of seed or coppice origin with participation of chestnut in the growing stock volume in 1964 having been subjected to further investigation. In the field, each stand (as depicted in 1964 management plan) was split into strata according to its current spatial heterogeneity. Area, altitude and share of chestnut in the total basal area were estimated for each stratum. Strata area and average altitude were measured by GPS positioning and calculations. Basal area was determined by measuring the diameter at breast height (DBH) of all alive trees larger than 12 cm in DBH in round measurement plots (0.125 ha in area) set in representative part of each stratum. A total of 215 measurement plots were installed in 180 stands.

Strata in which chestnut took more than 5.5% of the total basal area were further distinguished as separate stands and referred to as chestnut co-dominated and dominated forests (CCDF). All CCDF were grouped into two categories (i) chestnut co-dominated forests (hereinafter referred to as CCF) where chestnut basal area represented 5.5% to 55.5% of the total basal area and (ii) chestnut dominated forests (CDF) with chestnut basal area from 55.5% to 100% of the total basal area. Both CCF and CDF were grouped into altitudinal belts from 200 m to 1100 m a. s. l. by 100 m intervals. In order to study the latitudinal distribution of chestnut forests the studied territory was divided into three main

regions: (i) Western region – Kolarovska River to the east, the state boundary between Bulgaria and Greece to the south and the state boundary between Bulgaria and FYRMacedonia to the west; (ii) Central region – Petrichka River and the eastern border of Kongura Reserve to the east, the state boundary between Bulgaria and Greece to the south and Kolarovska River to the west; (iii) Eastern region – Rupelsko Gorge to the east, the state boundary between Bulgaria and Greece to the south and Petrichka River and the eastern border of Kongura Reserve to the west.

RESULTS AND DISCUSSION

In the Western region, the total area of CCDF diminished with years from 213 ha in 1964 to 115 ha in 2009 (Fig. 1A). Area reduction was as high as 20% in CCF (from 111 ha in 1964 to 88 ha in 2009, Fig. 1B) and 74% in CDF (from 102 ha in 1964 to 27 ha in 2009, Fig. 1C). For all categories (CCDF, CCF and CDF), the decrease in area was most pronounced in the altitudinal belt 400 to 500 m a.s.l. while slight increase was observed from 700 m upwards.

Decrease in the total area of CCDF in the Central region (from 1287 ha in 1964 to 1085 ha in 2009, Fig. 2A) was not as pronounced as in the western one. Nevertheless, areas in the altitudinal belt between 300 and 500 m diminished almost twice (from 493 ha in 1964 to 252 ha in 2009). At altitudes from 600 m upwards a slight increase in area of CCDF was observed (from 793 ha in 1964 to 833 ha in 2009). In Central region, total area of CCF increased from 433 ha in 1964 to 714 ha in 2009, the increase being prominent in the altitudinal belt from 500 to 800 m (Fig. 2B). At lower altitudes (from 400 m downwards), area of CCF decreased from 93 ha to 39 ha. Reduction in area of CDF was as high as 56% (from 854 ha in 1964 to 371 ha in 2009, Fig. 2C) and pronounced regardless the altitude.

The total area of CCDF in the eastern region increased with time (from 423 ha in 1964 to 478 ha in 2009, Fig. 3A). The area of CCF increased from 60 ha in 1964 to 228 ha in 2009 (Fig. 3B). The increase was prominent from 600 m upward. The area of CDF in eastern region diminished from 363 ha in 1964 to 250 ha in 2009 (Fig. 3C).

The total area of CCDF on the northern slopes of Bulgarian part of Belasitsa mountain diminished by 13% for the studied period (from 1923 ha in 1964 to 1678 ha in 2009, Fig. 4A), the peak of the distribution having shifted with 100 m upwards (from 500 m in 1964 to 600 m in 2009). The area of CCF increased by 70%, (from 604 ha in 1964 to 1030 ha in 2009, Fig. 4B), the change being prominent between 600 and 800 m. In contrast, the area of CDF decreased by more than 50% (from 1319 ha in 1964 to 648 ha in 2009, Fig. 4C). Reduction of CDF area was most pronounced at 400, 500 and 800 m.

The results of the study confirm the view of many contemporary authors (Horvat et al., 1974; Le Houerou, 1992; Conedera et al., 1998; Amorini et al., 2000; Mihaylov et al., 2007; Trajkov et al., 2007; Konstantinidis et al., 2008) about the quick dynamics of sweet chestnut forests. In case of the current investigation, chestnut co-dominated

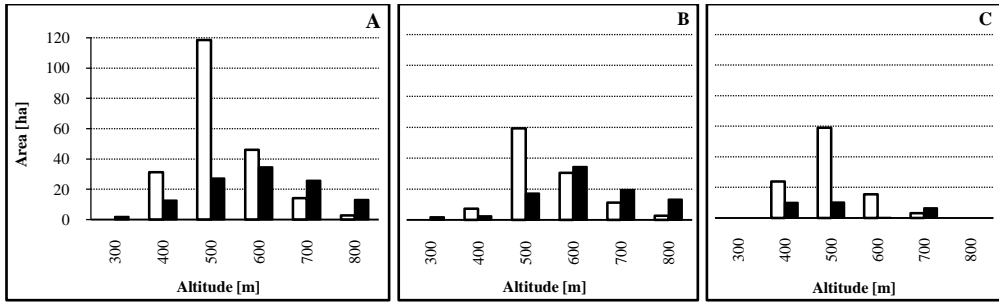


Fig. 1. Area distribution dynamics of *Castanea sativa* forests by altitudinal belts in the Western region. A. Chestnut co-dominated and dominated forests (CCDF). B. Chestnut co-dominated forests (CCF). C. Chestnut dominated forests (CDF) (□ 1964 ■ 2009)

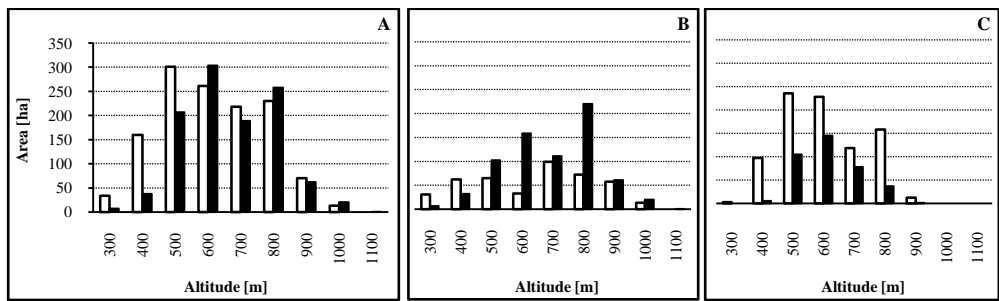


Fig. 2. Area distribution dynamics of *Castanea sativa* forests by altitudinal belts in the Central region. A. CCDF. B. CCF. C. CDF (□ 1964 ■ 2009)

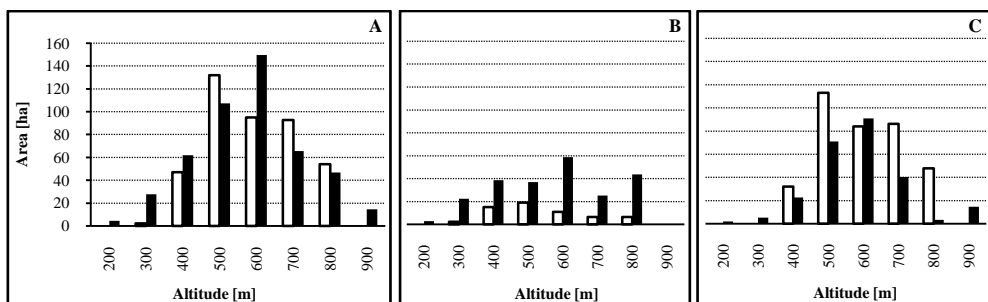


Fig. 3. Area distribution dynamics of *Castanea sativa* forests by altitudinal belts in the Eastern region. A. CCDF. B. CCF. C. CDF (□ 1964 ■ 2009)

and dominated forests (CCDF) on the northern slopes of Bulgarian part of Belasitsa Mountain have lost nearly 13% of their initial area since 1964 and now cover as much as 1678 ha. Chestnut co-dominated forests (CCF) have increased their area to 1030 ha while chestnut dominated forests (CDF) area has decreased to 648 ha. In other words, chestnut

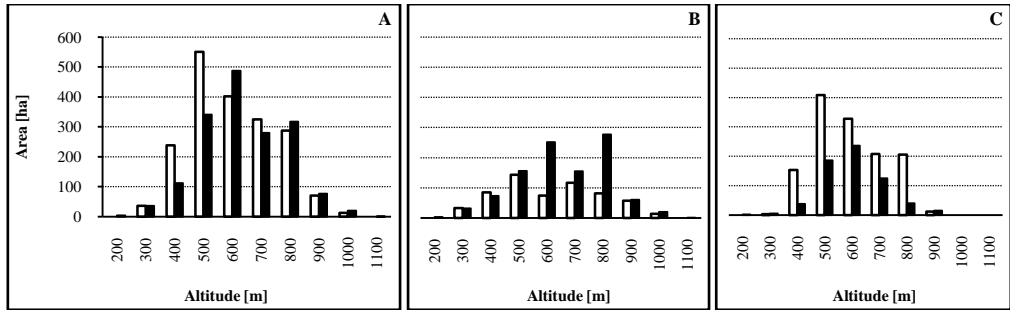


Fig. 4. Area distribution dynamics of *Castanea sativa* forests by altitudinal belts on the northern slopes of Bulgarian part of Belasitsa mountain. A. CCDF. B. CCF. C. CDF (□ 1964 ■ 2009)

has lost its dominating role in a half of the initial area of 1319 ha where it used to be a dominant tree species 45 years ago and has become a co-dominant species. In all studied regions, the distribution peak of CCDF have shifted with 100 m upwards (from 500 a.s.l. in 1964 to 600 m a.s.l. in 2009), CDF tending to decrease their area regardless the altitude. The only region in which the area of CCDF has increased is the eastern one, decrease of CDF area being also smallest here compared to the other two regions.

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