CLIMATIC IMPACT ON SCOTS PINE RADIAL GROWTH IN CHRONOLOGIES FROM DRY SITES OF SOUTHERN KARELIA.

Rumyantsev D.E.
Moscow State University of Forestry, Institute of geography of RAS
dendro@mgul.ac.ru

National State Kivach Reserve was established in 1931. Pine forests were the prevail at this territory, but at the reserve conditions, without clear cutting and with low frequency of ground fires, spruce forests part began to increase. Pine forests are still resistant to spruce penetration only on the dry sites and at the peatlands. A small rocks - “selgi” is the most usual site for dry pine forests. There is a high light transmission at such kind of stands. Lishens species from Cladonia genus are the common species of soil cover here.

Material and methods. Our research was conducted on the material of five pine dry sites from Kivach Reserve, every of each was characterized by twelve tree ring individual chronologies. Samples have been taken from tree stems (at the height of 1.3 meters) by inserting an increment borer. The ring widths were measured with an accuracy of 0.05 mm. The GROWLINE computer program was used to test for possible dating or measurement errors. Each individual ring width chronology was detrended by ring-width index calculation. Correlation analysis was used to reveal climatic influence on growth. Significant are the mean of correlation coefficients more than 0.34.

Results and discussion. Results of correlation analysis are shown in Fig. 1 and Fig. 2. As we can clear see from Fig.1 the June precipitation of growth year is an important factor of pine growth at the all dry sites. By the reason of a low soil moisture capacity, great insolation and thin soil layer drought stress is usual there and precipitation at the most intensive growth time positively affects on annual ring width. The dependence has curvilinear nature, if the time series segregate by years with above average June precipitation, and years with below average June precipitation, then correlation coefficients in the first case (0.03 -0.11) will be lower then in the second (0.43-0.74).

High winter temperatures, especially in December, and also in Febrary are negatively affects on pine growth (Fig. 2). Probably this explained by frost resistance decrease by the influence of above average temperatures during hardening and dehardening period [1]. November precipitation negative effect in two chronologies may be explained by frost hardiness decrease too. November abundant precipitation may results in stimulation of soil temperatures increasing, which results in pine roots hardiness decrease [2].

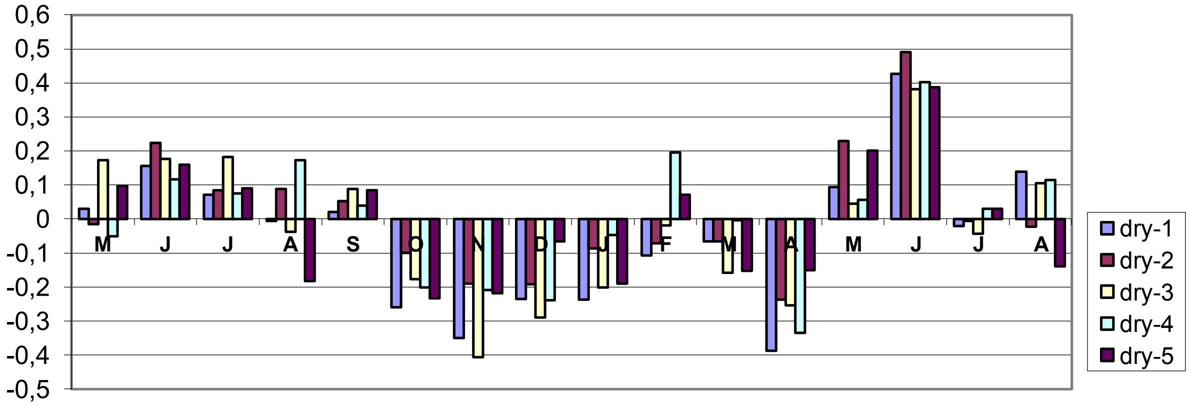

Fig. 1 Correlation coefficients between pine ring width indices and montly precipitation from May of the previous year to August of the growth year for different plots

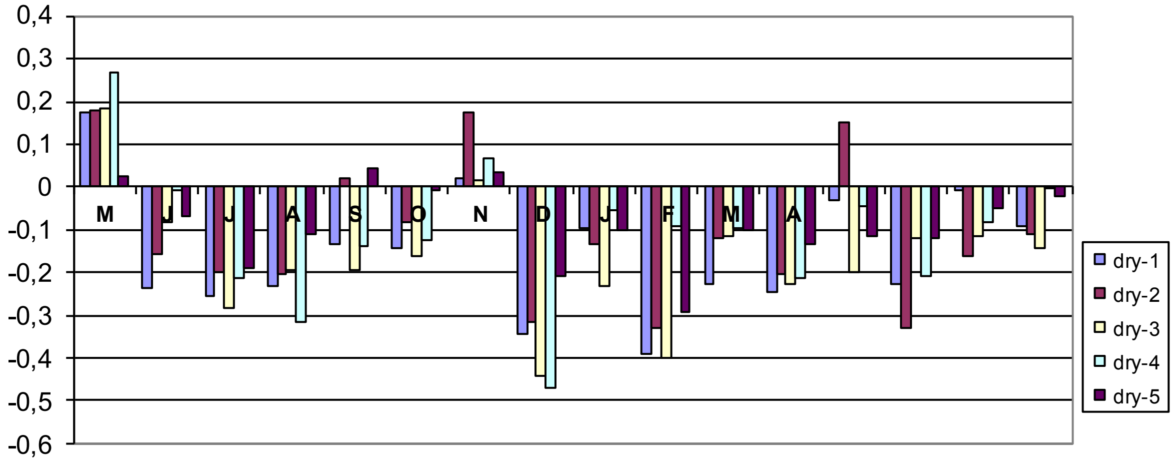

Fig.2 Correlation coefficients between pine ring width indices and monthly temperatures from May of the previous year to August of the growth year for different plots

Conclusion. Therefore, possible change to a warmer climate may lead to decline of pine forests on dry sites. The drought effect on pine radial growth is related with below average sum of precipitation in June, and this may be used in climatic reconstructions.

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References

1. Juntilla O. Plant adaptation to temperature and photoperiod // Agriculture and Food Science in Finland. Vol. 5, Num. 3, 1996. pp. 251-260.
2. Sutinen M.-L., Ritari A., Holappa T., Kujala K. Seasonal changes in soil temperature and in the frost hardiness of Scots pine (Pinus sylvestris) roots under subarctic conditions // Canadian Journal of Forest Research, Vol. 28, 1998. pp. 946-950.