



## **CARBON ISOTOPE ( $^{14}\text{C}$ AND $^{13}\text{C}$ ) EXCHANGE PROCESSES IN THE BIOSPHERE: CASE STUDY OF THE PLITVICE LAKES**

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Radiocarbon activity ( $a^{14}\text{C}$ ) and ratio of stable isotopes  $^{13}\text{C}/^{12}\text{C}$  ( $\delta^{13}\text{C}$  values) were measured in different samples collected in the natural habitat of the Plitvice Lakes: terrestrial plants (deciduous and coniferous), marsh and aquatic plants and surface soil. The  $a^{14}\text{C}$  and  $\delta^{13}\text{C}$  values were compared with those of the atmospheric  $\text{CO}_2$  as well as of dissolved inorganic carbon (DIC) of Plitvice waters with the aim of determining origin of carbon in the biosphere.

$^{14}\text{C}$  activity of terrestrial plants (100 to 110 percent of modern carbon, pMC) followed  $^{14}\text{C}$  activity of the atmospheric  $\text{CO}_2$ , with some differences between deciduous and coniferous trees.  $^{14}\text{C}$  activity of marsh plants partly submerged in the water (sedge) also followed the  $^{14}\text{C}$  activity of the atmospheric  $\text{CO}_2$ . Aquatic plants completely submerged in the lake waters showed different  $^{14}\text{C}$  activity depending on the sampling location and their  $a^{14}\text{C}$  correlated with the  $a^{14}\text{C}$  of DIC. Steady increase of  $a^{14}\text{C}$  of DIC in downstream direction also reflected in the increase of  $a^{14}\text{C}$  of the aquatic plants but the values were about 10 pMC higher than that of DIC. Top 20 cm of surface soil represented the average of organic material (humus) deposited in several years and  $a^{14}\text{C}$  it was slightly higher than that of atmospheric  $\text{CO}_2$  in the last year.

$\delta^{13}\text{C}$  values of measured samples correlated with the origin of carbon in different materials. For the plants which used atmospheric  $\text{CO}_2$  for photosynthesis, terrestrial plants and marsh (sedge),  $\delta^{13}\text{C}$  values ranged from  $-31\text{‰}$  to  $-27\text{‰}$ . The aquatic plants  $\delta^{13}\text{C}$  values varied in a wide range from  $-48\text{‰}$  to  $-30\text{‰}$ , showing that the source of carbon is mainly DIC in water and also carbon of organic decomposition. Plants partly consuming  $\text{CO}_2$  from atmosphere and partly from DIC, e.g. moss from the waterfalls, have less negative  $\delta^{13}\text{C}$  values and higher  $^{14}\text{C}$  activity than the aquatic plants.

$^{14}\text{C}$  activity and  $\delta^{13}\text{C}$  values of different plants collected in the Plitvice Lakes area and their correlation with atmospheric  $\text{CO}_2$  and DIC showed which processes and/or sources of carbon were involved in the biosphere of the karst area.